RIG

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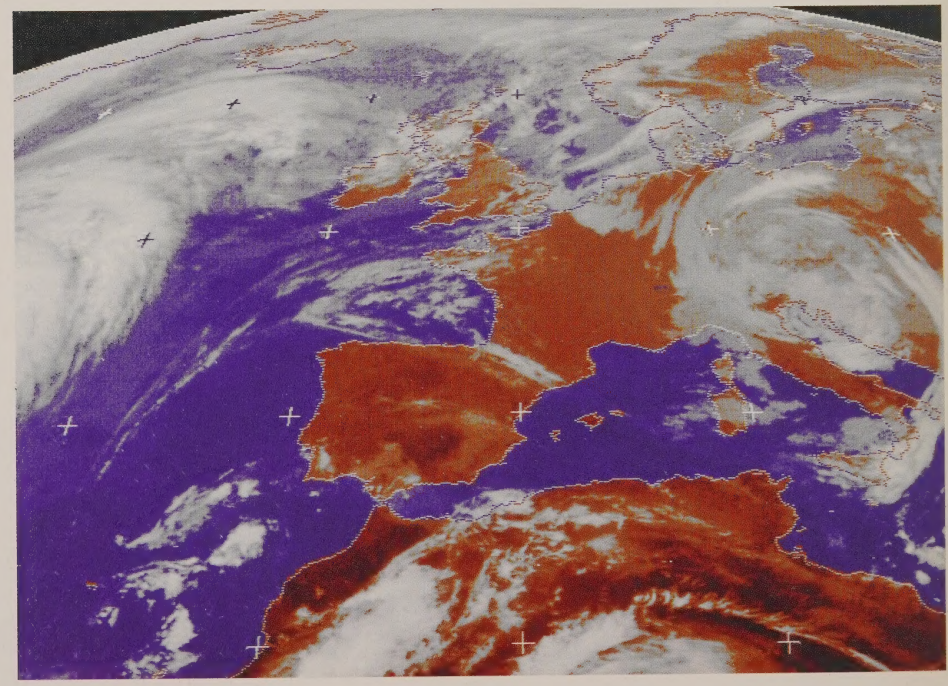

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Centre pages: Predictions courtesy Simon Goodall

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NOTE: RIG WXSAT BULLETIN is now available from G3CQL @ GB7NNA

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CHAIRMAN'S WAFFLE

HENRY NEALE

The European Union superglue has found yet another victim - Meteosat 5 now has an Electronically Despun Antenna problem. Once per revolution (100 rpm) the signal received drops by 3db! I would have thought that after the problems with Meteosat 3 it would never occur again. There is always the excuse that the later one was already built and couldn't be modified, but if it had been a launch vehicle problem - all succeeding vehicles would have been modified, even on site, if it was deemed necessary. It at least keeps your receiving systems up to scratch and quickly indicates those that need a little more leeway to keep the signals noise - free. I cannot see any reason why the other channel cannot be used instead of the present one for the tests which require 2 transmitters on the same frequency to be on simultaneously. All replies usually have the initial comment that if you are using a 2 metre dish you wouldn't be getting problems. If that is the case then why cannot these test be done on the other channel where most users are using larger dishes? They are automatically using more selective dishes to receive the Primary Data.

Not to be out-done NOAA 11 decided to have a heart attack. It would appear that the scanning mirror stopped either for mechanical or electrical reasons. Mind you - if your head had turned round as many times as it had - you would be feeling queasy! It would appear that the unit is not recoverable and is now destined to be mentioned in history books.

Whilst on the subject of health - I have recovered to as near normal as can be expected (some would have make other facetious comments made here!). Harvest went well and the new acquisition performed exceptionally well and I only had two complaints. The first was that I felt a proper prat when the hydrostatic transmission pipe burst leaving a pool of oil on the road and the combine blocking it. It is difficult to move like that and I was grateful for a tow out of the way. Fortunately it was a very minor road, but even so, too many vehicles gave some black looks before disappearing back the way they had come! Next time on the last few metres of my travel I will try and get off the highway - if possible! The other complaint was that the air-conditioning had a fault. It was impossible to turn it off - when evening approached, the air became cool enough without added cooling! I tended to jack it in that bit earlier! Harvest was completed earlier than usual and I can even report that I am now completely worked up and am waiting for the next operation to become due.

Another problem I have had has been a re-arrangement in my domestic situation, but that is all behind me now and I am hoping to get re-organised and re-domesti-

cated before the rubbish bin overflows into the bedroom, bathroom, kitchen, etc! RIG work has been made much easier now that all mail order has been handled by Peter. A few small items are occasionally despatched from here but only occasionally. I am pretty well up-to-date with correspondence but there are just a few items that need more careful consideration and will eventually result in a phone call, where possible, to finalise any outstanding queries.

JVFAX is now the most commented on subject and with the release of version 7 even hardened users are commenting on its amazing features. It does take a little getting used to initially but then it can be used as if it was a standard solution to everyones problems. Hardened users even comment that even their continual use still reveals new, undocumented features. I feel that after I had used it for a few hours - at a rally, it performed better that the unit we had previously used. It has higher definition and I believe a better signal/noise performance in noisy conditions. The range of things that you can do with the images after they have been received is also amazing and some are documented in this Journal and the previous one. I am told that it not so good on slowscan but that might be dealt with in the future. I have just heard that Mark Clarke, our Treasurer, has done a deal with Martelec to handle their interface unit, and as usual, at very realistic prices. No doubt there will be details elsewhere. I am certain that you would like me to thank Eberhard Backeshoff DK8JV for all his hard work in initially producing this software, in refining it to its present level and also making it available as "Freeware". There is no charge for the use of "Freeware" but may I urge you to send Eberhard a donation for it to encourage him to keep up the good work and produce even more refinements / additional features in the future.

The bulletin board has been to the doctors and is now only locking up approx twice per week. This makes a change from several times per day. The problem was probably cause by the PC being locked to 19200 and 38400 baud at the same time. Discovery and rectification of this and several other minor misdemeanours by Chris Smith have brought it back to life - BT line permitting. I am now getting 14400 baud contacts with other European countries regularly and the number of failed calls is now very much reduced. One tip for those regularly using it is that if you aren't quite sure of the file name it is possible to use a * but remember that there could a lot of files called *.* so be a little more discriminating. Several people still pull the plug when leaving. Whilst this doesn't normally cause many problems it only takes a "G" followed by another"G" to do the job properly and it can be done in a lot of places in the system. The code change was forecast for the middle of October 1994 but the new exchange didn't even arrive by then. It is now planned for the middle of January 1995. In view of the poor quality lines it has been planned to install a EBB down in London so when the new one is ready we will advise you.

Best wishes Henry

FROM THE EDITOR'S DESK

PETER WAKELIN

In July comet Shoemaker-Levy 9 slammed into Jupiter at colossal speed and released enough energy to scar the visible surface of the planet for weeks on end. Our cover images of this event were well received and GIF image library sales more than doubled. Three months later, other energetic natural phenomena made the headlines. These were much closer to home and for the residents of Rabaul in Papua New Guinea one was right on their doorstep. I refer, of course, to the recent volcanic eruption in Rabaul followed a short time later by one on the Kamchatka peninsula in Russia. The latter eruption started just a few hours after the Space Shuttle Endeavour was launched on a mission which included a programme of imaging active volcanic regions by radar. Both of these events are covered in this issue.

Excluding Endeavour, we could have four imaging spacecraft from four nations launched in the space of a few weeks. Okean 4 from Ukraine and IRS-P2 from India went up in the first half of October. Electro, from Russia, was finally launched on 31 October. The Electro programme, formerly known as GOMS, was started as far back as 1975 and has experienced numerous delays since then. Hopefully, the fourth will be NOAA-J due for launch in early December.

An article in the "down-under" magazine Amateur Radio Action in June, by RIG member Arthur Andrews, generated so much interest that the formation of an Australian Remote Imaging Group seems imminent. We wish them every success. Outside of the cities I don't think they will have too much of a problem with pager interference!

In spite of having an ambitious space programme and a population many times that of Australia, there is not a single RIG member in India. Perhaps when Electro is successfully orbiting above a point near Sri Lanka and is transmitting easily available APT images there will be an increase in interest.

Mark and I are rounding off our first year on the Journal with a larger than usual issue. My promised piece on orbital elements has been delayed again and my regular item on image interpretation has been held over. To all those who have contributed to the Journal during the year I am very grateful. If you wish to comment on the Journal, or any other RIG matter, you can utilise the space on the membership renewal form or, if you wish, you can contact me directly. The Season's Greetings to you all. ⊕

MEMBERSHIP SECRETARY'S REPORT FOR 1994

Ray Godden G4GCE

As of October 26th: TOTAL RIG MEMBERSHIP = 1875 ('93 = 1674)

Analysing the figures:

Renewing members	1,412 - 80% of 1993 ('93 = 85%)
New members 1994	430 - 23% (566 - 34%)
1993 members not renewing	375 (195)

Again we have had a large influx of new members, giving a significant increase in total membership. This increase was tempered by the fact that the percentage of renewals has been somewhat lower this year. Further investigation suggests that the renewal rate is lowest amongst those who joined in the last two years; possibly some of those attracted in by our advertising found that RIG was not for them. However, overall we can be pleased to achieve yet again a notable increase in membership.

Radio amateur members	1,113 - 60% (60%)
Overseas members	319 - 17% (17%)

Both of these categories are at the same level as last year.

The overseas members by country:

Sweden	51	The Netherlands	40	United States	30
Ireland	27	Australia	22	Belgium	17
Italy	17	New Zealand	15	Germany	14
Norway	10	France	9	Spain	7
West Indies	6	South Africa	5	Switzerland	5
Luxembourg	4	Malta	4	Oman	4
Denmark	3	Greece	3	Canada	3
Japan	2	Finland	2	Falkland Islands	2
Mauritius	2	Arab Emirates	2	Borneo	1
Cyprus	1	Fiji	1	Hong Kong	1
Kenya	1	Thailand	1	Portugal	1
Russia	1	Samoa	1	Saudi Arabia	1
Sri Lanka	1	Zimbabwe	1		

We now have members in 39 countries compared to 35 in 1993. Sweden has now taken the lead from the USA and The Netherlands.

To break down the UK membership by county:

Antrim	5	Avon	37	Bedfordshire	31
Berkshire	36	Borders	4	Buckinghamshire	34
Cambridgeshire	39	Central	6	Cheshire	31
Cleveland	6	Clwyd	10	Cornwall	29
Cumbria	18	Derbyshire	28	Devon	54
Dorset	36	Down	3	Dumfries/Galloway	8
Durham	4	Dyfed	7	Essex	67
Fermanagh	1	Fife	4	Glamorgan	16
Gloucestershire	25	Grampian	11	Guernsey	1
Gwent	9	Gwynedd	5	Hampshire	62
Hereford/Worcester	26	Hertfordshire	47	Highlands	6
Humberside	19	Isle of Man	9	Isle of Wight	13
Jersey	4	Kent	52	Lancashire	36
Leicestershire	24	Lincolnshire	36	Greater London	68
Londonderry	3	Lothian	4	Greater Manchester	24
Merseyside	29	Norfolk	22	Northamptonshire	14
Northumberland	5	Nottinghamshire	31	Orkney	2
Oxfordshire	27	Powys	3	Shetland	2
Shropshire	14	Somerset	19	Staffordshire	25
Strathclyde	22	Suffolk	30	Surrey	70
Sussex	63	Tayside	10	Tyne & Wear	12
Tyrone	2	Warwickshire	15	West Midlands	38
Western Isles	1	Wiltshire	19	Yorkshire	74

As you might expect, membership follows population density - most members are in the South East - but there are significant concentrations in the West Country and Yorkshire.

The response to the Activity Survey was again very profitable with most members providing information. Again there were very many comments, all of which are welcomed be they complimentary, critical or constructive. Please make whatever you feel about RIG clear to us in this year's Survey!

The following use only data from this year; all previous data were deleted.

Receiving:

Polar orbiters	1,154 ('93=886)	HRPT	53 (32)
Geostationary	655 (523)	PDUS	52 (28)

The number of those receiving the high resolution modes has again almost doubled.

Viewing method:

Computer	906 (684)	Frame store	69 (261)

There has been a dramatic drop in the use of frame stores with a corresponding increase in computer viewing.

Types of computer:

IBM compatible	796 (566)	Archimedes	37 (58)	BBC	28 (59)
Amiga	31 (52)	Atari	9 (21)	Macintosh	2 (7)

The IBM continues its apparently inexorable dominance: all others have fallen in popularity.

Viewing hardware/software:

Dartcom	49 (283)	Timestep	519 (194)	Home brew	185 (163)
Maplin	29 (94)	Martelec	43 (62)	ICS	18 (18)
Spacetech	57 (7)	Quorum	28 (2)	TH2	20

Here, Timestep are firmly in the lead. The 1993 figure for Dartcom is anomalous, either due to error or to confusion caused by a badly-posed question. Some other manufacturers are showing significant gains - Spacetech, Quorum and TH2 (no '93 figure).

Receiving equipment:

Timestep	353 (400)	Home brew	194 (127)	Dartcom 344	(104)
Martelec	72 (66)	Maplin	53 (113)	Cirkit	48

Perhaps the most interesting point to note is that home brewing seems to be increasing.

Interference: 381 (288) This is disappointing, the downward trend shown last year being very much reversed. No doubt the proliferation of pager transmitters is a major cause but there are others. This year we have more comprehensive questions in the Survey about interference - please complete this section if you are experiencing problems. We need more information with which to confront the regula-

tory authority and to help receiver manufacturers make their products more robust in this respect.

We have 187 (146) members involved in some way with education. This is a slightly higher percentage than last year.

Well, this my third year as Membership Secretary has gone quite smoothly. Although the volume of work has increased I have become rather more efficient at dealing with it (with considerable help from my wife, Chieko).

This year we have made renewal even more convenient for you, credit card payment is available to everyone and you can renew for two years. ⊕

PLEASE ALL OF YOU FILL IN AND RETURN THE RENEWAL FORM AND SURVEY IN THIS ISSUE. DO NOT WAIT FOR A REMINDER.

***** DO IT NOW *****

HELP WANTED

The following members have sought help or advice. If you feel able to help then please contact them directly.

Kenneth Hughes, 220 Broadlands Drive, Lawrence Weston, Bristol, BS11 0PN, is seeking image files with the extension .DTA for viewing on his Atari ST-FM computer.

Mark Radford, 32 Millfields, Writtle, Chelmsford, CM1 3LP, (tel 01245 420521 - evenings/weekends) writes: Is it possible to use a TV satellite receiver front-end as a cheap down-converter for Meteosat? The geostationary satellite down-link frequency falls within the IF range of the TV satellite LNB to receiver interface. Second-hand front ends are available for a few pounds and would convert 1.6945 GHz down to near baseband. Would it be possible to feed this output directly to a decoder or would it require FM demodulation first? If the IF of the tuner were offset to say 6 MHz then perhaps a TBA120 would do the trick. Has anyone tried this or got any comments?

Mr GS Dutton, 40 Grafton Road, Harwich, CO12 3BD, is seeking a way to mount feeds to use a single dish antenna for both satellite TV and Meteosat reception. ⊕

RIG MEETING WITH THE RADIOCOMMUNICATIONS AGENCY

John Tellick

It was briefly mentioned in the last Journal that RIG met with the RA in May to discuss registration of receiving stations, frequency allocations and pager interference in the 137 MHz band.

Representing the RA were:
Terry Jeacock,International Coordination and Regulation Group,
Brian Last and Robert Cooper, Space Services.

Representing RIG were:
Henry Neale, Frank Bell, Dave Cawley and John Tellick.

The situation regarding registration was reported in the last issue. Here is the RA's response to our meeting received from Terry Jeacock.

1. International frequency management.

"Article 8 of the International Radio Regulations contains a table of world-wide frequency allocations to radio communications services. Apart from the allocations to "true" global services, such as aeronautical and maritime, this table gives administrations considerable flexibility to use these allocations to meet national requirements. For example, an allocation to the mobile service may in one country be used by police systems and in another by taxis. There will also be quite wide variations in technical characteristics e.g. channel spacings, duplex separations and effective radiated power.

"Administrations may also depart from the international table by operating, for example, mobile systems in a band allocated internationally to the broadcasting service. This is within the provision of RR342, i.e. provided no interference is caused to, or protection claimed from, the services of other countries operating in accordance with Article 8.

"The requirement for, and benefits of, harmonised radio systems and frequencies between neighbouring countries is, however, becoming increasingly important. Within Europe, the harmonisation of frequency use is undertaken by the CEPT European Radiocommunications Committee (ERC) and the harmonisation of equipment standards by the European Telecommunications Standards Institute (ETSI). The ERC is working towards a common European Table of Frequency Allocations

to be in place by 2008. The preparatory work for this is undertaken by Detailed Spectrum Investigations (DSIs), which examine existing use of, and future requirements for, specific parts of the spectrum. For each DSI, administrations, industry, user groups etc., are invited to send their comments to the European Radiocommunications Office (ERO), the ERC's permanent group of experts based in Copenhagen (details attached), which manages the DSI process. As mentioned at our meeting, the UK's response to the current DSI (29.7 - 960MHz) acknowledged the extensive use of the 137-138MHz band by universities, schools and the public for weather satellite reception.

2. National frequency management.

"In the UK, the radio spectrum is jointly managed by those government departments or agencies which have a direct responsibility for radiocommunications. For example, RA is responsible for all civil services and the Ministry of Defence is responsible for defence communications, including the Meteorological Office radio requirements. Consultative procedures are available to coordinate requirements and use, including the technical examination of new radio systems to determine interference potential. This includes preparation of a "national DSI" (see above).

3. Development of 138 MHz paging in the UK.

"The information above sets the scene to examine one of your (RIG's) particular concerns, the development of wide area paging (classed as a mobile service) on frequencies between 137.975 and 138.200 MHz.

"The paging services concerned are licensed by RA and are operating in accordance with international and UK national regulations. The equipment is type approved to a national specification which aligns with a European standard.

"Reference to Article 8 of the Radio Regulations shows that the band 138-143.6 Mhz is allocated to the Aeronautical Mobile (Off-Route) services. In accordance with RR342, the UK has, for many years paired 138-141 MHz with 105-108MHz to provide 2-frequency (semi-duplex) channels for mobile radio networks. As a result of the World Administrative Radio Conference (1979) decision to re-allocate 105-108 MHz to broadcasting, alternative pairing arrangements were made for parts of 138-141 MHz. Also a recent Anglo-French frequency coordination agreement divided equally the band 138-144 MHz into preferential sub-bands, such that some parts of the band became unavailable throughout most of England.

"The frequencies around 138 MHz remained unpaired but available to the UK and therefore ideal to increase the UK's wide area paging capacity and promote competition in the provision of these services. RA recognises paging as offering an extremely useful, convenient and cost-effective communications system for emergency, business and social applications. The additional frequency, 137.975 MHz was allocated to paging following an arrangement between the RA and the government department responsible for services in the range 137-138 MHz. Although the international allocation to mobile services in this band is on a secondary basis, in the UK, 137.975 MHz is allocated to paging on a primary basis provided no interference is caused to the primary services of other countries (on THEIR territory). RA has no plans to seek further frequencies for paging in the range 137-138 MHz.

4. Status of meteorological-satellite stations in the UK.

"As mentioned in (2) above, the frequencies allocated to the meteorological service are managed by the MoD for the Met. Office whose stations are registered and protected by means of the UK inter-departmental coordination procedures. RA does not consider it to be appropriate to apply these procedures to obtain protection for other meteorological-satellite receiving stations (e.g. for private use). It would not be in the overall interests of the UK to require emergency services, commercial operators etc. to undertake costly site-engineering or other measures to provide this protection.

5. International coordination and notification of stations in the Meteorological Satellite Service.

"There have been recent discussions on this subject between the WMO and the ITU Radiocommunication Bureau (formerly the International Frequency Registration Board - IFRB) in relation to the additional allocations to the Mobile-Satellite Service in the bands 137-138 MHz and 1675-1710 MHz made by the WARC-92. (Some) RIG members should have received directly from the WMO a copy of IFRB Circular letter No. 924 which included an Annex giving an "understanding" between the two organisations on this issue. RA, at the request of the UK Meteorological Office (via the MoD), will undertake the action recommended in (b) of this Annex, i.e. will register, with the ITU-RB, typical receiving stations representative of those used by the Meteorological Office.

"In Europe the commercial demand for mobile-satellite systems below 1GHz is far from certain. However, RA would not wish to prejudice UK options to meet future

requirements by indicating to the Bureau that protection is required for stations in the Meteorological-Satellite Service other than those used for "official" purposes.

Terry Jeacock,
International Coordination and Registration Group, RA."

These were the most relevant responses to RIG's worries and I would be pleased to receive any comments RIG members have on the statement. I might add that even Terry Jeacock of the RA, a RIG member, is having problems with pager interference.

The address for the ERO mentioned in para. 1 is
The European Radiocommunicatons Office (ERO),
Holsteinsgade 63,
DK - 2100 Copenhagen,
Denmark. ⊕

FROM THE TREASURER
Mark Clarke, G3CQL

As another year draws to a close I have moved into the background within the organisation to allow Sheila Newcombe to step into the treasurer's role. Sheila kindly offered her services after reading my note in the June issue. In the last 3 years we have seen RIG's turnover increase dramatically culminating in VAT registration; good for some, not good for all!

The coming year will see the extension of credit-card facilities for UK membership renewals without any surcharge. However, the surcharge of 3% will still be applicable when buying goods. Our offer of a two-year membership should also appeal to many.

I am also pleased that subscriptions for 1995 have been held at their current level, primarily due to good housekeeping and secondly, we have been fortunate in receiving a VAT refund backdated to our original registration. This has led to negotiations with the authorities, culminating in a 50% VAT allowance on the group's subscription rates. This means that only 50% of your subscription will be subject to VAT. ⊕

FOR SALE. One 2-metre dish. Offers. Also YAESU FT1 £650 or exchange for PDUS or HRPT. Phone George on 01787 462414.

RIG REGIONAL MEETINGS

Frank Bell

Interest in remote imaging means engaging in a fast-moving technical and scientific medium. Sometimes it can be difficult to keep up-to-date with the latest news, satellite launches, receiving and decoding hardware, processing software and upgrades, encryption, station registration and a host of other aspects of our specialist hobby.

Radio rallies are a way of keeping up-to-date and members are always welcome at the RIG stands, but by no means all our members attend rallies. A national gathering is difficult, and potentially expensive, to arrange but I feel there is scope for local meetings which is largely unexplored territory for RIG.

I would like to encourage people to start regional meetings for members. The pattern of meetings must suit local members. Possibilities are an evening meeting every two months, a Saturday afternoon every 3 months, a meeting and lunch twice a year, or any combination and frequency of these suggestions.

The current UK membership of RIG is about 1500 and the distribution of these members may be judged by referring to the membership secretary's report in this issue. It can be seen that, as might be expected, members are generally concentrated in centres of population but there are other regional concentrations which should not be neglected; Devon, for example.

If you would like to start a regional group and would like a list of members in your target area then please get in touch with Ray Godden, our membership secretary (address on page 2). New members, I feel quite sure, would benefit greatly by having access to regional meetings. Please consider holding regional meetings in your area. ⊕

SATELLITE IMAGERY USED IN HAITI OPERATION

Images from the French SPOT satellite together with military satellite images were used to generate maps of Haiti, to replace the US Army's thirty-year-old ones, when an invasion of Haiti seemed likely. The new maps were current within 10 days! Three-dimensional digitised versions were used for mission planning and rehearsals.

Other satellites played a role in the operation; tactical video conferencing through secure circuits on NASA's Advanced Communications Technology Satellite and the Army also used recently purchased INMARSAT terminals for communication and weather data. ⊕

ENCRYPTION UPDATE

Frank Bell

The issue of encrypting meteorological satellite data is a contentious one but the reality, however unpleasant, has to be faced. It is to be introduced. Test transmissions from Meteosat 5 have started.

RIG has been particularly active on behalf of its members in trying to influence the outcome and implementation of encryption. The Prime Minister's office, two Ministers, a number of Westminster MPs and MEPs have been contacted. It became clear during this phase of our lobbying that a number of the various arms of British government did not know what the others were doing. In particular the Department for Education did not know what the MOD, in the form of the Met Office were proposing. RIG has had a meeting with the Chief Executive of the Met Office and their Director of Observations opened the remote sensing conference in Guildford last April. Representations were also made to him on that occasion. Information and suggestions provided by RIG have had one very positive outcome. There now exists a joint working group between educational interests and the Met Office. This group has already met once and further meetings are expected. RIG's interests are represented in this working group.

I think it fair to say that the Met Office do not want to obstruct true amateurs and educational institutions from receiving and using meteorological satellite images provided no direct or indirect commercial use is made of the data. There seems to be goodwill between the between the Met Office and educational interests. However, EUMETSAT seem determined to protect their data from exploitation by rival commercial interests. Behind this statement may lie a complex web of international politics, with not everybody knowing what is going on, or even caring. Organisations may be persuing their own agendas for their own particular reasons. Above all, a pearl of wisdom from a very influential person in our own Met Office; "Don`t expect politicians to be rational!" What is becoming clear however, out of all the confused stories and suggestions is that encryption is going to happen; it will not go away! Commercial involvement in the use of the image data and commercial investments in the new satellites themselves will ensure this.

As best as I can judge, our Met Office are currently trying to establish a system where every UK user station receiving Meteosat data is registered, both SDUS and PDUS. As yet, nobody appears to know how this is to be achieved but the Met Office want a simple system, possibly done on a block basis. The costs of any licence is still to be determined but it seems that it will not be expensive for amateurs or education.

Although encryption is going ahead, because of RIG's representations some

unencrypted slots will remain available. The current suggestion is that four unencrypted images per day will be disseminated.

Reception of encrypted PDUS will require hardware and involve a licence fee. I do not know the fine detail of EUMETSAT's plans, or even if firm plans exist. A positive move from EUMETSAT has been to send out a letter, background papers, a registration form and questionnaire to a number of users in this country. If you have not seen this material and would like a copy please send a large SAE to me (FJ Bell, Coturnix House, Rake Lane, Milford, Godalming, Surrey, GU8 5AB). I strongly suggest that every PDUS station registers with EUMETSAT and even if you do not currently receive PDUS but might one day, then register.

RIG will continue to promote the interests of its members following the development of encryption. In following a technically challenging hobby we must expect to face some problems as new generations of satellite emerge. In the meantime however, we will continue to point out to whoever is most appropriate the impact that encryption will have on many existing users. ⊕

BOOK

At the RIG Conference last year Jim Bacon, Anglia TV's weather forecaster, recommended a book called "Basic Meteorology", which he had used at college. I persuaded him to send a letter to my wife saying that this book might be better appreciated than socks for my birthday. He very kindly did this but no book appeared. Apparently, the book had been re-written as :

FUNDAMENTALS OF WEATHER AND CLIMATE by Robin McIlveen

ISBN 0 412 41160 1 0 442 31476 0 (USA) Publisher: Chapman and Hall.

My wife discovered the above information after a long search and, thanks to Jim, I did not get socks for Christmas. The book is a mine of information backed by mathematical analyses for the more advanced reader. Keith Holland, G3MCD. ⊕

PORTABLE WEATHER SATELLITE TERMINALS FOR US AIR FORCE

The United States Air Force has awarded a contact to Harris Corp.'s Information Systems Division to supply about 140 portable weather satellite terminals. The terminals are small enough to travel with advance ground troops and can provide up-to-the-minute weather information from the Defense Meteorological Satellite Program (DMSP) satellites as well as the civilian polar-orbiting and geostationary ones using a 60cm dish. ⊕

GEOSTATIONARY WXSAT STATUS REPORT

METEOSAT 3 continues as the operational satellite at 75W and will remain so until the new GOES 8 takes over. This is now expected in February 1995.

METEOSAT 4 remains in standby mode.

METEOSAT 5 continues as the operational satellite at zero degrees longitude. It developed an antenna fault in mid August. Early in the autumn eclipse period one column of dipoles in the electronically despun antenna system became inoperative resulting in a brief 3 dB drop in the signal during each revolution. The spacecraft spins at 100 revolutions per minute. It is not clear whether the fault is electrical or mechanical. Meteosat 3 has suffered with a similar problem since launch.

The temporary transmission schedule introduced in September was in operation longer than expected due to extended work at the Lannion ground station in France. The new schedule, which is reproduced in this issue, should be in use by the time this is published.

METEOSAT 6 continues to suffer from the problems reported in RIG 38 and it is felt that little more can be done at the spacecraft level. What will happen now is that the spacecraft will not be manoeuvred for several months and contamination (ice build-up on the cold optics) will be allowed to accumulate beyond the normal level. Then in January the sensor unit will be decontaminated (heated up to vaporise the ice) with the hope that the situation will be improved. Newly launched Meteosats have to be decontaminated two or three times during their first winter (less often as they age) due to minute quantities of water which are inevitably present on the spacecraft at launch.

It is hoped that revised software for correcting Meteosat 6's problems will be ready by May 1995.

GMS 4 continues to function well at longitude 140E.

GOMS/ELECTRO. See Soviet and Chinese Scene for the latest news.

GOES 7 has been in orbit for almost 8 years and operates as the "GOES WEST" craft, currently at 112W. On 20 Dec it will commence drifting towards 135W.

GOES 8, the first of a new, advanced generation of spacecraft was launched in April. Inevitably with a new and complex spacecraft a long and careful checkout phase is required. At the time of writing, in late October, most tests are complete, routine imaging has commenced and the handover of operations to NOAA has

taken place. It is currently close to 90W longitude and its slow eastward drift towards its operational longitude (75W) is now due to begin on 17 January. This spacecraft has the ability to scan a small area at one-minute intervals and with a resolution of 1km some excellent imagery of storm development will be available. This mode has already been successfully tested and it is hoped to reproduce such a sequence of images in a future issue of the journal.

We are grateful to Gordon Bridge, Meteosat Operational Programme Manager, EUMETSAT, for making the above Meteosat information available just before our press deadline.

GOES 8 10 May 1994 1600UT. Visible image of southern Wisconsin with River Mississippi (left) and Lake Michigan (right).

NOAA POLAR-ORBITER STATUS REPORT

NOAAs 9, 10 and 12 are all showing signs of their age with significant deteriorations in image quality. However, in spite of its 9 years of operation, NOAA 9 is still producing quite acceptable imagery. It started life as an early-afternoon ascending-node spacecraft but over the years it has lost sun-synchronism due to the perturbing effects of the sun and moon and its daytime passes are now southbound in the late morning. With approaching winter in the northern hemisphere, this craft will provide the best visible imagery until NOAA 14 is operational.

NOAA 11 developed a serious problem at 2330UT on 13 September. The scanning radiometer ceased to function and recovery attempts have now been abandoned. A failed transistor in the scanner's motor circuitry is thought to be the most likely cause. The sounders and other instruments aboard the spacecraft continue to function satisfactorily.

NOAA J, to be re-named NOAA 14 when in orbit, is now (late October) scheduled for launch on 4 December. Additional testing and some modifications have been carried out following the NOAA 13 failure. The "aliveness" test on NOAA J was completed on 22 October and the spacecraft was turned off in preparation for shipment to Vandenburg Air Force Base. The Atlas II E launch vehicle was erected in October and it was established that none of the gyros on board was flightworthy. Replacements can be made available in time to meet the 4 December launch but there is some doubt whether back-up units can be calibrated in time. ⊕

EUROPEAN SPACE AGENCY PUBLICATIONS

A number of publications are available from ESA which may be of interest to members. Several quarterly periodicals are also available of which ESA Bulletin and Earth Observation Quarterly are probably the most suitable. Costs are low and in some cases there is no charge. For further information contact ESA Publications division, ESTEC, 2200 AG Noordwijk, The Netherlands. ⊕

FOR SALE. Proscan 4.1 scanning receiver, preamp,crossed dipoles (with reflectors), Prosat board and software, 47-element loop Yagi, RIG LNA kit, LNW downconverter (unused), set populated frame-store boards (new). Offers (will split) to Graham Hewitt G4IVN on 01493 728194.

THE METEOSAT SYSTEM - PART 1

Peter Wakelin

Introduction

In this series, which will run to several parts spread over the next few issues, I will endeavour to give a more detailed account of the complete Meteosat system than has appeared in the Journal before, yet not make it too incomprehensible for the non-technical reader. Many members are familiar with the imaging service but there are also less widely known services offered through the system. In this first part, I shall give a brief overview of the whole system and have a look at the spacecraft itself.

Overview

Before Meteosat

It is now over thirty years since the first weather satellites were built and successfully orbited. Although they were rather primitive by today's standards, the benefits to be gained from them were immediately apparent. The earliest ones were in low Earth orbit and were unable to take night-time images. The infrared scanning radiometer came into use in the early 1970s.

Although the low polar-orbiters can achieve complete coverage of the Earth twice a day, what meteorologists really needed was a continuous view of part of the globe. The ATS series of satellites (Applications Technology Satellite) started in late 1966. They were experimental in nature and were extremely successful in demonstrating imaging and communications capabilities from the geostationary orbit 36,000 kilometres above the equator. Further developments led to the string of imaging spacecraft that girdle the Earth today.

Planning and Organisation

The Meteosat programme was developed to satisfy the needs of European meteorological agencies and also as a contribution to the World Weather Watch programme set up by the World Meteorological Organisation (WMO) to maintain routine monitoring of almost the entire globe. Research aspects were not overlooked and the Meteosat programme planners also considered the needs of the Global Atmospheric Research Programme undertaken jointly by the WMO and the International Council of Scientific Unions.

Meteosat 1 was launched on 23 November 1979. In its two years of imaging it successfully achieved all its objectives. Meteosat 2 was the second in the "pre-opera-

tional phase" and was equally successful, as was the third.

It was the French meteorological and space agencies who initiated the Meteosat programme, then in 1978 the European Space Agency (ESA) took over Meteosat Operations. Other European nations were greatly encouraged by the early successes and considered joining the 8 ESA countries already supporting the programme to form EUMETSAT.

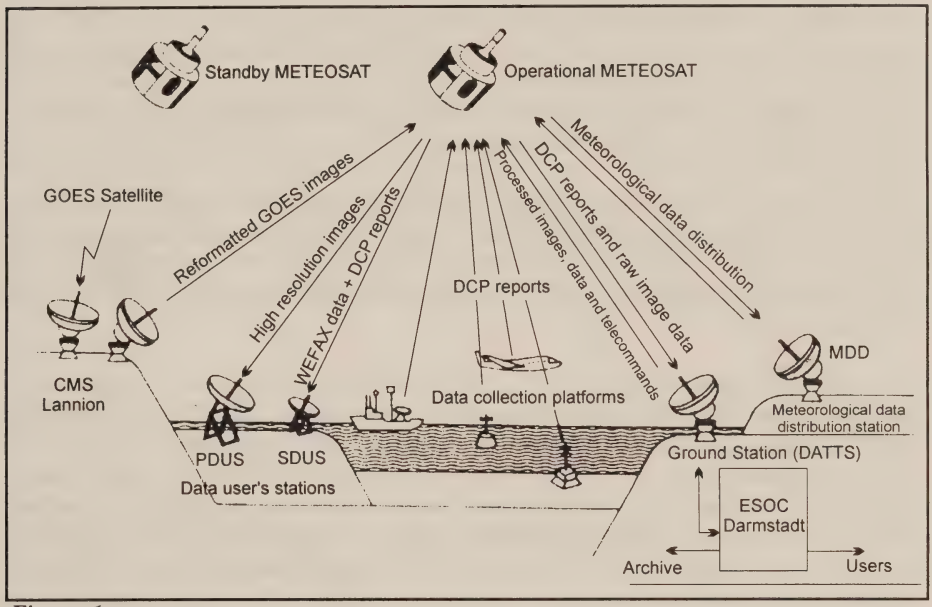


Figure 1

The Meteosat Operational Programme (MOP) began in late 1983 when ESA agreed to start building the new satellites of the MOP in anticipation of the creation of EUMETSAT. EUMETSAT, with headquarters in Darmstadt, Germany, took the overall and financial responsibility for MOP in January 1987, but ESA continued to execute the programme, supervising the building of the satellites and continuing to operate Meteosat for EUMETSAT. By 1991 EUMETSAT was responsible for operating the spacecraft in orbit through the European Space Operations Centre (ESOC) which is also in Darmstadt.

The System

Figure 1 shows the principle components of the Meteosat system. The primary satellite is situated 35,800 kilometres above the Gulf of Guinea and there are back-up satellites near by. The main components of the ground segment are the Data

Acquisition, Telecommand and Tracking Station (DATTS), the Meteosat Ground Computer System (MGCS), the Meteosat Operations Control Centre (MOCC) and the Meteorological Information Extraction Centre. DATTS is located some 40km from Darmstadt while the other components are located within ESOC.

Earth imaging, dissemination of images and other meteorological data, and data relaying are the three main missions.

IMAGING: The radiometer operates in three spectral bands, one in the visible and near-infrared, one in the infrared water vapour absorption band and one in the thermal infrared band. Half-hourly images are generated with a resolution of 2.5km (visible) or 5km (infrared) and transmitted to DATTS. From there they go to MGCS for more processing, distribution and archiving.

DISSEMINATION: Processed imagery from MGCS, together with images relayed from other satellites, are broadcast in two forms via two channels on Meteosat. High resolution digital images are transmitted for reception by Primary Data User Stations (PDUS) and Secondary Data User Stations (SDUS) can receive the analogue (WEFAX) images.

DATA RELAY: Meteosat has a facility to relay messages from Data Collection Platforms (DCP) to ESOC through its 66 communications channels. These platforms can be on land, sea, or on aircraft or even balloons. In most cases the data are relayed automatically. Two channels of encrypted data in the Meteosat Data Distribution (MDD) mission are also relayed through Meteosat. One channel transmits charts originating from the UK Meteorological Office at Bracknell and the European Centre for Medium-range Weather Forecasts (ECMWF) at Reading, UK, and the other transmits alphanumeric data in the standard World Meteorological Organisation (WMO) code forms from Rome, Italy.

There are two further major functions: The extraction of meteorological parameters, such as cloud top heights, sea temperatures and winds derived from cloud motion, performed by the Meteorological Information Extraction Centre, and the archiving of 600 million bits of data every hour from the radiometers on board the satellite.

The Satellite

Structure

The spacecraft is well illustrated in the EUMETSAT photograph on the back cover of this issue. The maximum diameter is 2.10m and the overall length is 3.20m. Its

mass is 320kg at launch which includes 39kg of hydrazine propellant for orbit changes. Its shape can be considered as three concentric cylinders. The largest, which is almost entirely covered with solar cells for power, contains the imager as well as most of the craft's other subsystems. The central cylinder can be seen to be covered with numerous dipole elements. The spacecraft is spin-stabilised at 100 revolutions per minute with its axis parallel to that of the Earth and as it spins the S-band dipoles pointing towards Earth are electronically switched in. The narrower cylinders on top are S-band and UHF toroidal antennas.

Maintaining Position and Orientation

The Sun and Moon do not lie in Earth's equatorial plane and are sufficiently close to pull the geostationary satellites off the equator in time. Also, Earth's gravitational field is not uniform and Meteosats tend to drift eastwards. To offset these perturbing effects 4 hydrazine thrusters and two small vernier motors are built in to the spacecraft. The main thrusters control the orbit of the satellite and the orientation of its spin-axis and need to be activated only every few months. The small vernier thrusters keep the satellite spinning at precisely 100 revolutions a minute.

Power

Meteosat is in sunlight continuously for most of the year but for about 3 weeks on either side of the equinoxes in March and September the satellite passes into the Earth's shadow for a short period each day. Most of the instruments are switched off during these eclipse periods but two rechargeable batteries are available to power essential circuits. Thousands of solar cells around the satellite supply adequate power when in sunlight and sufficient surplus to keep the batteries charged up.

Communications

Most communications through Meteosat are at about 1.7GHz in the S-band. The raw image comes down on 1686.833MHz and the processed images are on 1691.0MHz and 1694.5MHz. The MDD re-transmissons of UK data are received on 1695.7520MHz and those up-linked from Rome come down on 1695.7874MHz. Telemetry and ranging frequencies are also in the S-band. Information from the Data Collection Platforms is received at 402.0-402.2MHz in the UHF band.

The Radiometer

The optical system of the radiometer consists of a telescope of the compact Ritchey-Chretien design with an aperture of 400mm and a focal length of 3650mm. It is mounted in such a way that its pointing direction relative to the spacecraft's spin axis can be controlled very precisely by a jack screw and a stepper motor.

The polar-orbiting spacecraft's imagers use rotating mirrors to scan across the track and the orbital motion to build successive scans into an image. Meteosat uses its spin rotation to scan from east to west and then within one revolution the telescope is moved so that it scans 5 kilometres further north. The Earth subtends an angle of 18 degrees from Meteosat's position and 2500 revolutions (in 25 minutes) are needed to scan the entire disk from south to north and from east to west. The telescope then moves back to its starting position in 2.5 minutes and a further 2.5 minutes are needed to stabilise the system before the next scan commences.

There are 8 detectors distributed across the focal plane of the radiometer of which four will be in use at any one time; 2 in the visible part of the spectrum each with a field of view of 0.07 milliradians, one in the IR (water-vapour) band and one in the IR (thermal) band. These latter two have a field of view of 0.14mrad, twice that of the visible detector. An angle of 0.07mrad is equivalent to a distance of 2.5 kilometres at the sub-satellite point. The visible detectors are of the silicon photodiode type and operate in the 0.5 to 0.9 micrometer band. Both the IR detectors are mercury/cadmium/tellurium types and the water-vapour one operates in the 5.1 to 7.1 micrometer range while the thermal IR one is sensitive to radiation at 10.5 to 12.5 micrometres.

There are 2500 scan lines in each image and each IR scan line consists of 2500 pixels. As the field of view of the visible detector is only half the size, each of the 2500 lines contains 5000 pixels. As there are two visible detectors in use simultaneously, it is possible to build up an image of 5000 lines each with 5000 pixels.

The IR detectors have to be cooled to about 90K to reliably measure the radiances of the coldest parts of the Earth and this is achieved by a radiator surface at one end of the spacecraft. It has to be shielded from radiation from Earth and the Sun by a complex arrangement of reflectors and radiators. Because the IR detectors operate at very low temperatures, their optics slowly become contaminated with deposits of ice and other substances that have vaporised from warmer parts of the spacecraft. This can be compensated for by increasing the gain of the IR amplifiers. These gain increases are announced in the routine admin messages. When contamination becomes severe, the detector unit is heated to about 30C to vaporise the deposits.

[Numerous publications relating to the Meteosat Programme are available from EUMETSAT for a small charge or, in some cases, at no cost. Much of the above was taken from "Introduction to the Meteosat Operational System" published by ESA as BR-32. For further information contact: The Information Officer, EUMETSAT, Am Elfengrund 45, D-64242 Darmstadt-Eberstadt, Germany.] ⊕

THE NOAA 13 FAILURE

The probable cause of the failure of the NOAA 13 meteorological satellite in August 1993 was a short-circuit that prevented the solar array current from powering the spacecraft and recharging the batteries. The failure most likely occurred in a battery charge assembly, probably by a 1.25 inch screw that extended too far below an aluminium plate designed to dissipate heat. The screw end penetrated the insulation and made contact with a radiator plate, causing the short-circuit.

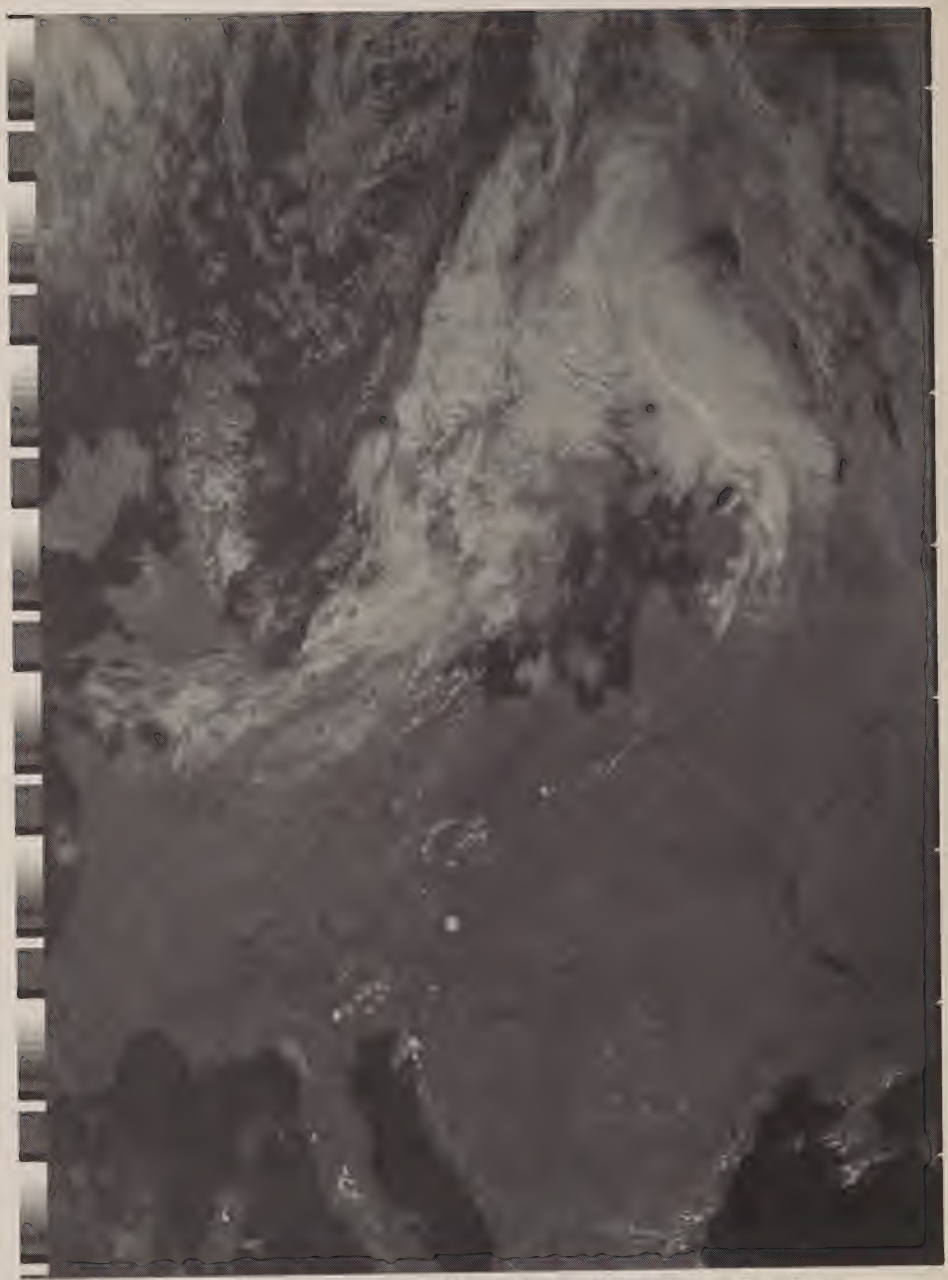
"The board concluded that the design of the charge assembly is prone to a failure of this type." said Jeremiah Madden of NASA's Goddard Space Flight Center, Greenbelt, MD, who chaired the 12-member investigating board. "The design requires meticulous construction procedures and there are many areas where a short could occur."

Launched into an 870 kilometre near-polar orbit on 9 August 1993 the $77 million spacecraft operated normally until 21 August. During orbit 175, 12 minutes after the satellite's last communications link with the NOAA Command and Data Acquisition site at Wallops, VA, the short-circuit occurred. Controllers did not communicate with NOAA 13 again until orbit 177 when they noted battery low voltage and high temperature flags on all three batteries. Controllers were unable to acquire a signal on orbit 178 and no further signals from the satellite were received.

In reaching its conclusion as to the probable cause, the board looked at hardware being used to build NOAA J, the next in the series due to be launched as NOAA 14 in December 1994. The team compared 12 relay mounting screws from the stock used for NOAA J, with dimensions of the NOAA J relay mounting and found that 10 of the 12 screws were long enough to penetrate the insulation layer lending "credence to the possibility that the failure on NOAA 13 was due to such a screw" the board reported.

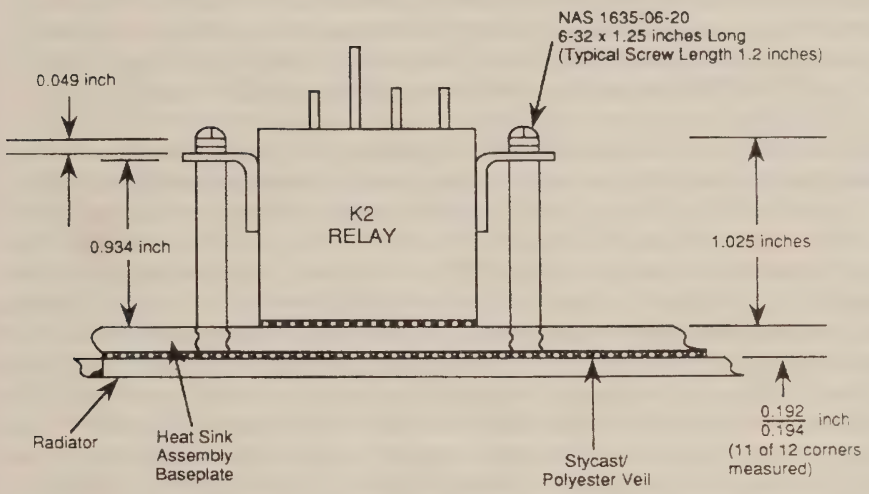
Although there was a specific instruction for checking the the box for protrusion, "the quality control plan for building the BCX box (battery charge assembly box) was inadequate." according to the team. "There were not enough checks performed on the unit as it was being built. The procedures were not adequate to inform the technician of the criticality of the unit and to give him specific instructions on how to check his work." The team attributed the lack of inspection partially to the repeated successful flights of this BCX design. "This unit's heritage goes back to at least 1972. The first assembly technicians were probably extremely careful and understood the criticality of the design. However, in time and with personnel changing, there was probably some loss of knowledge and awareness."

The board made 21 recommendations for future spacecraft and all are being imple-



NOAA 13 Ch2 16 August 1993. Bertel Andersen, Gothenburg, Sweden

mented by NOAA's project office. Modifications to NOAA J have already been carried out. In addition, the prime contractor and builder, Martin Marietta Astro Space, has undertaken intensive reviews of every satellite it is building. ⊕



1. Length: From top of washers to bottom of baseplate

   1.025 inches - Two washers, relay flag spacer
   + 0.192 inch - Baseplate and insulation
   1.217 inches - To radiator

2. Screw lengths ≥ 1.217 inches touch the radiator

3. Measured NAS 1635-06-20 screw lengths

   Actual lot number used on NOAA -I, -J, and -K

   Screw length specified as 1.250^{+000}_{-030} inches - Minimum length 1.220 inches

#	Length (Inches)	#	Length (Inches)	#	Length (Inches)	#	Length (Inches)
1	1.216	4	1.219	7	1.218	10	1.216
2	1.218	5	1.217	8	1.218	11	1.221
3	1.219	6	1.217	9	1.219	12	1.217

JVFAX70 AND THE MARTELEC INTERFACE - HINTS AND TIPS

Mike Goodall, G0MGI

It's funny how things seem to go in circles... Fashion, music, etc. In the Remote Imaging reception market, the first popular system was Amigasat from Martelec, then, when the PC became so popular the Timestep PROsatII (and its little brother PCWsat3, now discontinued) was born. This became the number one system for several years, until JVFAX?! Although this program, by a German radio amateur (originally developed for the reception of Amateur Radio Slow Scan), has been around for some time, it is only recently that a ready made interface for it has been available in this country. The JVFAX Interface by Martelec (at around £100 with the free JVFAX70 software) is a professionally built unit (in a small die cast box) which, with the special lead, plugs into one of the serial ports of your PC; it doesn't come with the lead, but you can either make your own, or purchase one as an extra from Martelec for a few pounds. This is a handy feature for those members with PCs who don't like dismantling their computer to insert interface cards. Most PCs have the mouse system on Com1, with the other Com2 port often unused, which is ideal for connection to the Martelec JVFAX Interface. Don't be tempted to use a standard 25 pin to 9 pin adapter and a standard 9 pin serial lead; it won't work, as non standard pins and wiring is employed! The JVFAX system, in my opinion, and in the opinion of many other seasoned Rigleys I have spoken to, is by far the best system for Meteosat reception, and certainly displays a better resolution than all it's predecessors. It also automatically selects a colour mask and palette for each picture received by reading the digital header at the start of each picture transmission. Although the program at present does not support gridding, temperature measurements or country outlines on polar orbiters, it does receive Russian Meteors a lot clearer than rival systems, and with perfect sync. The four very fine sync bars, situated next to the binary coding blocks, were seen clear and sharp on Meteor 3-5 for the first time ever (on other systems they appear as a grey blur).

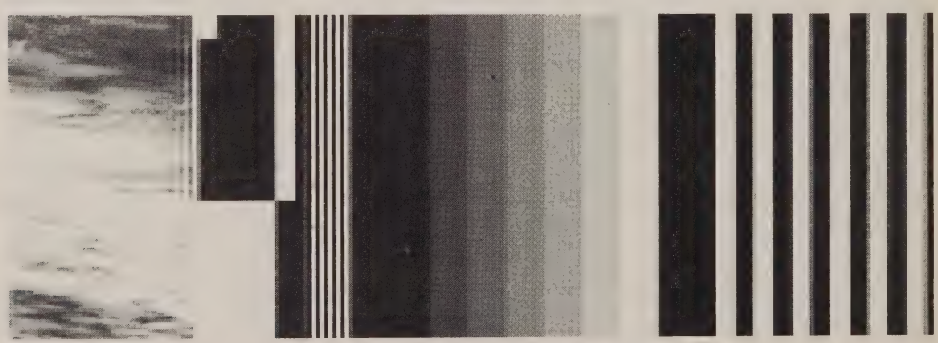


Fig.1 Sync Bar system on METEOR 3-5 showing the fine sync bars.

It does take a few minutes to configure to your computer, but once done it can be forgotten about. The documentation with the interface tells you how to set some of the essential values on the Configuration page to match it to the JVFAX70 program, as well as the wiring of the interface lead. If in any doubt, leave the rest of the settings on the config. page as their default values.

A few tips follow, that may be of help to new users...

Print out the manual from the text file. Although it's 52 pages long (a tome compared with other systems' documentation!) it is very useful, and a must to have at your right hand when exploring the many facets of JVFAX70. Every time I took a look at the program I found new things that I could do with it!

A useful feature is the ability to go straight to the Mode you require (e.g. Mode 3 - Meteosat Ch.1) when you run the program, which is probably the most commonly used mode. This is set up in the Mode Editor.

Leave your computer on for about an hour before adjusting the Oblique Skew Correction, as your computer clock changes frequency very slightly as it warms up. The easiest way to set this up is to wait for 20 seconds after the reception of a picture has started, restart the program and press "A". This will give you a picture with the sync bars luckily towards the centre of the screen (but probably with a slant). When you have nearly a screen full press the "/" key and a vertical line appears in the centre of the screen. Hold down the control key and press the left or right cursor keys to lay the line over the sync bars. Then press the cursor keys on their own to make the line align exactly with your sync bars. When you exit this mode your machine will be set up to receive the sync correctly.

When setting up the level for Meteosat adjust it so that the peak whites just, and only just, start to burn out. Don't adjust it so that most whites burn out in order to brighten your pictures that may at first look a little dull. Instead, brighten up the palettes a little if your monitor is one of the low radiation types, many of which are a little dark even with the brightness and contrast controls at maximum. To brighten the palettes display your saved picture in the "Show" section, press "1" for the palette section, and press "8" a few times to brighten. When you have it about right, save the palette as IR, VIS or WV, whichever is used on the picture. Next time a picture is received it will use this brighter palette. Before you start this procedure make sure you copy the original (.pal) palette files into a spare directory such as "default", so that if anything goes wrong you can copy the originals back to the main program. You can also adjust the palettes for Contrast, but it is unlikely you will need to do this, except when making your own palettes for NOAA IR pictures. Don't overdo it or you will loose some of the subtle grey tones. When setting up the receive level for NOAAs, you have the greyscale sectors next to the

sync bars to help you. Try and adjust the level so that you see a complete set from black to white. It is preferable to have two or more blacks the same than several of the brighter segments all the same shade of white.

A useful feature is the ability to set up the program to receive and automatically save specific pictures at specific times in the Date Editor section. For Meteosat pictures it is best to set the variable Time Overlay to 2 and the Max. Duration to 5 mins, unless you require two consecutive frames. Don't forget to set the Save mode to "on" and APT "active".

If you want to receive pictures in black and white as well, the easiest way is to install the program again under a different name (e.g. "JVFAXBW") or copy all the directories and files over to the new directory. The B/W version should have all the palette and mask files deleted; it will then receive all your pictures in B/W. There are ways to do B/W within the program, but you will need to keep changing the settings back and forth, so a duplicate program, if you have the room on your hard drive, is the easiest option. If this extra version of the program has been copied over to a different sector of your hard drive, you will have to alter the Config. page settings to tell it where to store your pictures (e.g. D:\JVFAXBW\PICS).

You can delete the DOC and BONUS directories and their files once you have read them, to tidy up your drive and save a little space.

If you set your computer clock fairly accurately, and then leave the program running for 24 hours on Meteosat with the "Read Digital Header" option "on", the program will update the Meteosat schedule should ESA change it at any time (see the .SCH files). If you are running the "Movie sequence" program on receive the program can also update your computer clock automatically from the accurate start times sent by the Meteosat transmission.

If you like the look of your IR pictures with the VIS palette whilst in the receiving mode, just copy the VIS palette over the IR palette by calling it IR.pal. Remember to copy all the files to the "default" directory you made earlier in case things go wrong. You can, of course, display the picture later and apply the VIS or any other palette to it.

NOAA pictures can be directly received, and displayed on the screen, with just one channel, IR or Visual. Make sure that you set it up for IR or VIS on the "M" setting on the reception mode screen, and set the sync option "N" to the same mode. I have found it is best to set these up with the signal to the interface switched off, otherwise weird situations or crashes can occur.

To save Polar Orbiter pictures, press F3 before the signal appears and when the

signal dies away you will have a JVFAX001.TMP file of the complete pass. If you forget to turn on "F3" save before receiving, you can save the picture up to the point received, at any time, by pressing "F2". This will save the image as a "temppic.gif" file, but it does not increment, so if you press "F2" again you will loose the first file! Quit to the reception mode; back to the main menu; press H to put you into the view mode; load the temp file; adjust zoom box; select the portion required and press return. This will display the selected portion; and if you then press F2 you can save it with your desired file name. When using the zoom function, press "4" first. This will keep the screen display ratio of 3/4. If this option is on you can hold down "shift" and use the cursor keys to resize the zoom while keeping it in the 3/4 ratio. If you wish to alter the palette press "1" to enter palette mode. Normally a few presses on "6" to increase contrast, and one of two on "8" to brighten are required on NOAA IR pics. When the result is to your liking press F2 again and it will give you the option of resaving the picture with the adjusted palette. You can of course save the palette for future use by pressing "S". The new palette can then be used for future pictures with a similar contrast range. Back in the view menu you can delete the original temp file which could be anywhere from 2MB upwards.

Finally, sit down and read the manual. You will be amazed at the options and versatility of this program. Look at all the various options at the bottom of the screen, etc. when in each mode. You will find no end of options. All users should give a big round of applause (and send a small donation if they can afford it) to Eberhard Backeshoff for all the work he has put in to this revolutionary and excellent program; especially as he has made it "Freeware" (no registration or payment required, unless you wish to do so). He always welcomes feedback from it's users, so if you are taken aback by it, as I was, drop him a line. I just can't wait for JVFAX80! ⊕

TALK ON "RECEIVING WEATHER SATELLITE PICTURES"

Keith Holland, G3MCD, will be giving a talk and a live demonstration of weather satellite image reception to the Southgate Amateur Radio Club in North London on Thursday 12 January 1995 commencing at 8pm.

The meeting will be held at: Winchmore Hill Cricket Club, The Paulin Ground, Firs Lane, Winchmore Hill, London. (Car park at the junction of Firs Lane and Fords Grove.)

RIG members will be very welcome. If you need details, or directions on how to get there by bus or train, please contact their Meetings Secretary, Mary Craine, on 0181 889 1448. ⊕

JVFAX FREQUENTLY ASKED QUESTIONS... ANSWERED (Part 2/2)

Mark Pepper

Following on from part 1 in the last issue of the RIG Journal, I will cover finding FAX transmissions and getting JVFAX to display them correctly. Note: Since the last issue, version 7.0 of JVFAX has been released and is available on the RIG BBS and from the Shareware Library.

Where do I find fax and what does it sound like?

HF fax signals have a "scratchy wheel" sound when sending pictures and a carrier tone when idle. They can be found easily in the maritime bands. Unlike RTTY, there are few variations and, as far as I know, no transmissions are encrypted.

APT fax signals have a regular "tick tock" sound when sending a picture but generally have no tone when idle. The exceptions are the idle periods on Meteosat channel 1 where a carrier tone can be found. Obviously, polar orbiting satellites will only be heard when in range.

Two stations that can be heard regularly on the US East Coast are NAM, Norfolk, VA on 3.356 and 10.865MHz, and CFH, Halifax, NS on 4.271MHz, 6.4965 and 10.536MHz. CFH sends faxes on the hour, generally.

Two stations that can be heard regularly in the UK are Bracknell Meteo on 2.6185MHz and Offenbach Meteo on 115kHz.

What modes are HF faxes usually sent in?

Weather faxes are usually sent with an IOC (Index of Co-operation -the ratio of width to height of picture) of 576, and at 120 LPM (Lines Per Minute). Press faxes generally use an IOC of 288 and an LPM of 60. JVFAX has a number of predefined modes available for both HF FAX and satellite APT transmissions. These are available in FAX mode by pressing the number keys (not the Keypad numbers). For example, pressing key "7" while in FAX mode will select NOAA mode and set all appropriate parameters suitable for receiving ascending NOAA passes.

How do I tune into HF fax signals?

Using Bracknell Meteo, (2.6185MHz LSB) as an example:

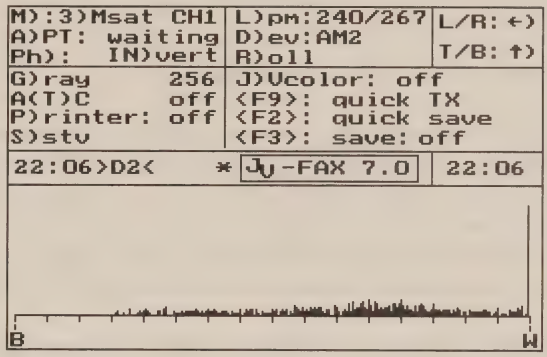
1) From the JVFAX main menu, press "F" (Fax), and you'll be shown a blank screen with a tuning indicator and a menu box on the bottom of the screen. Note that

version 6 has the menu box along side the tuning indicator, whereas version 7 has the two sections placed one above the other.

2) Select a suitable HF fax mode by pressing '1', Wefax 576.

3) Set the deviation to 400 by hitting the D key until 400 is displayed next to 'dev' in the menu area.

4) Using your BFO, RIT or clarifier, tune the signal (in lower sideband) until you see a peak on the tuning indicator. Tune this peak towards the W (white) end of the scale (This will normally be 1.9 kHz below the centre frequency, in this case 2.6166MHz). The indicator should look like this:



5) Press "A" (APT). The display should read "Running" and you should start to see a fax appear on the screen! To stop receiving, press "A" again.

NOTE: If you have selectable filters on your receiver, set them to "wide" or "fax" and set the RF gain as high as possible without overloading.

I cannot get good satellite pictures with my simple comparator interface.

The simple comparator interface is designed to allow JVFAX to demodulate FM modulated picture information. Satellite picture data is AM modulated and, therefore, this interface is inappropriate for polar and geostationary APT satellites. It is appropriate for HF fax transmissions which have the data FM modulated.

Note: With HF fax transmission the actual image data is used to FM modulate a 2.4kHz carrier, the total of which is then used to AM modulate a radio frequency carrier. With satellite transmissions, the image data is used to AM modulate a 2.4kHz carrier, the total of which is then used to FM modulate its radio frequency carrier. Consequently, the decoder types required to receive satellite and HF fax images are very different.

I don't get a fax, or I get something garbled.

Check the mode. Most HF fax transmissions use "Wefax 576", mode 1 in the program. The LPM should be 120. APT faxes should be received with the satellite's appropriate mode. There should be no need to change the settings predefined by Mr Backeshoff. Check your connections to the interface. If they're in order, you may have an RFI or interrupt problem (see questions in "General Hardware Problems").

I get a fax, but it comes out slanted.

Press "/" when in FAX mode and a line will appear down the screen. Use the arrow keys to tilt and move the line so that it lines up with a line on the fax that should be vertical (such as a border or a chart line). Press "Enter", and the fax should now come in straight. Note that this is a permanent adjustment, and you shouldn't need to change this ever again (unless you change your computer hardware), no matter what faxes you subsequently receive.

I get a fax, but it's not aligned with the edge of the screen.

Press "R" (Rotate) when in FAX mode and move the line with the arrow keys to the left edge of the fax (there may be a black bar where the fax is supposed to start). Press "Enter" and the fax should now be properly aligned.

My fax is negative!

You're receiving the fax on the wrong sideband. Try the other sideband. Most HF faxes are sent in LSB. A few press stations transmit negative pictures (JVFAX can be set to fix this, see the manual.)

My fax is too dark / My fax is too light.

Your receiver is mistuned. If the fax is too dark, tune towards the white end of the tuning scale (peak moves towards W). If the fax is too light (washed out), tune towards the black end of the tuning scale (peak moves towards B). With APT images, this adjustment is often available as a gain control knob on the front of the interface.

Also, make sure the deviation is set correctly (400 for most HF faxes). This is especially important for receiving the GOES satellite images that NAM and other stations send.

I started receiving a fax, but JVFAX stopped it (APT "waiting").

When reception is noisy or weak, JVFAX often interprets a noise burst to mean "end of picture". Press "A" again to restart receiving. If this happens more than once, you probably won't get a very good fax anyway, however, you could try modifying the squelch and sync thresholds in the Misc Settings menu that can be found as a sub menu off the Configuration Menu.

How do I save a fax to disk?

While you're not receiving a fax (APT "waiting"), the "S" key (F3 key on V7.0) will toggle the save-file option on and off. Faxes will be saved in .GIF (pronounced JIF incidentally) format to the disk and subdirectory you specified in the configuration screen.

I enabled Save to File, but when I press "A" to start a fax, the Save feature turned off.

Go to the configuration screen (C from main menu) and check the save file specification. JVFAX won't save to a file if there's a typo (like "C:\\JVFAX") but it won't notify you of the error either.

How do I print a fax?

There are two ways to print from JVFAX:

1) While you're in the fax receive mode and not receiving a fax (APT "waiting"), "P" will enable your printer. It's a toggle so pressing P again will disable printing.

NOTE: You cannot have both Save to File and Print options enabled at once. Also, once the fax is printing, the Rotate command will not work on the printout.

2) Select "H" (Show and Send Pictures) from the main menu and select the fax you want to print. When it appears on the screen, press "P". JVFAX will ask how much width it will print in (0-100%), press "Enter" for the default (100%).

The GIFs I save are too big! How do I shrink them?

It's not uncommon for weather fax images to be very large, especially if you regularly receive Meteosat images. These can easily exceed 500 kilobytes.

There are several methods you can use to shrink the size of your GIFs:

1) You can crop them. From the main menu select H (Show and Send Pictures); from the directory listing, select the file you want to crop. The fax will show up on the screen-select the "Z" (Zoom) option. Use the arrow keys to move the zoom box (which is about the size of a regular 640x480 VGA screen), and the X, Y, + and - keys to resize it. Press "Enter" and the cropped image will fill the screen. Press "S" to save it (under a different name.)

2) You can reduce the resolution on faxes to be received. Most faxes (of the Wefax 576 variety) have a resolution of 1810x1000, which makes for beautiful printouts, but is overkill if you're just using a GIF viewer.

To fix this, go into the Mode Editor ("M" from the main menu) and select the mode you normally use (e.g. Wefax 576). Step through the options with the arrow keys and select Resolution. For Wefax 576, it'll normally be 1810. Enter a smaller value (800 is OK) and press "Enter".

If you're only interested in charts and not satellite images, select the Grays option and set the number of shades to 2 (B&W only-no grey scale). Your GIFs should be much smaller, though at a significant loss of resolution.

I get an all-white/all-black signal, no matter what signal is coming in on the receiver.

I get horizontal white/black bands on my pictures.

I get a white peak on the tuning indicator that doesn't move.

Either your audio cable to the interface is broken, or you have an interrupt conflict between serial ports. If it's the latter you may need to move the interface to another port. (See "General Hardware Problems" for more on troubleshooting this.)

General Hardware Problems.

Can I use EMM386/QEMM or other memory managers with JVFAX?

Generally, no. JVFAX with the simple comparator interface connected is interrupt-intensive and uses up most of the CPU cycles. That's the price you pay for having the demodulation and decoding done in software. JVFAX comes with its own memory manager, anyway.

Note: While JVFAX and HIMEM.SYS seem to work fine, if you have interrupt problems (blank pictures, streaks), try removing "DEVICE=HIMEM.SYS" and "DOS=HIGH" statements from your CONFIG.SYS before using JVFAX. I've not

seen any problems with HIMEM.

If you regularly use EMM drivers, Windows or Desqview, make up a minimal boot disk disabling all such programs, before running HamComm, JVFAX or PKTMON.

I get noise from my computer!

One of the most difficult problems in linking PCs with radios is RFI. It's beyond the scope of this article to cover every possible contingency, but here are some suggestions:

1) Keep your computer and your antenna well separated from each other and use good, well-shielded, coax for the lead-in.

2) The decoder interface should be shielded. Use a metal or foil-lined box. Use good shielded cable for both the audio and data connections.

3) Use RFI toroids (available at Maplin, Tandy & Radio Shack etc) on all cables.

4) Install 0.1 uF capacitors from the DTR and RTS lines to ground.

5) Install a 1:1 audio isolation transformer between the decoder and the radio. (I believe Henry has a number of these available).

6) Make sure the monitor, printer and their connecting cables are well shielded. Monitor noise is very common, as is printer noise.

7) Read Tom Woolner's article "Computer Generated noise and radio reception" in RIG 38.

Some HF fax frequencies.

Here's a short list of HF FAX frequencies heard around the world. It's nowhere near complete, but it'll get you started. These are mostly meteorological stations, with some press stations thrown in.

All FAX stations have a LPM and IOC of 120 and 576 unless otherwise noted. All frequencies are in KHz:

Station	**Frequencies (kHz)**
GFA, Bracknell, U.K	2618.5 4610, 8040, 14436, 18261

NMN, Portsmouth, VA USA	3357, 10865
NPM, Pearl Harbour, HI	4855, 9390, 21839
NPG, San Francisco, CA	6453, 9090
IMB55, Rome, Italy	8146.6
KCNA, North Korea	8020, 8152, 10524, 10580, 11430, 11476, LPM 60/IOC 288, 11536, 13580, 14452, negative 14568, 14580, 15633
ECA7, Madrid Meteo	3650, 6918, 10250
USAF, Offutt AFB, NE	3232, 6905, 11121, 19327
AXM32, Melbourne, Aus.	5100
AXM34, Melbourne, Aus.	11030
AX134, Darwin, Aus.	10555

There is now a database program of weather fax stations, WXFAX, that contains information on 101 stations on 312 frequencies, which may be sorted and printed in any order. It also includes sample faxes. A demo copy can be found on nic.funet.fi, directory pub/dx/software/msdos/misc, file WXFAX.LZH.

END OF THE NIMBUS ERA

Nimbus 7 is to be switched off after more than 14 years of reliable service and outstanding science data collection. This marks the end of 30 highly successful years of Nimbus operations. Unlike the operational APT meteorological satellites the Nimbus series was designed primarily for atmospheric and oceanographic research. Nimbus 7 will be remembered for the remarkable images from the Coastal Zone Color Scanner and its predecessor, Nimbus 6, which carried the Total Ozone Mapping Spectrometer and was also a very long-lived craft, made many of the measurements that led to the discovery of ozone depletion above the polar regions.

REMOTE IMAGING REMOTELY

Ben Ramsden

The author explains how he used a lightweight, battery-operated weather satellite station in a remote area of Iceland to take images of the Arctic region from polar-orbiting craft.

The Drama

"We're going to be flooded out", I told the others. "We must dig some channels to direct the water around the tents". Reluctantly, several people climbed out of their sleeping bags, donned waterproofs and boots, grabbed their ice-axes and started to build a small canal and dam system reminiscent of the ones I used to build as a kid on a beach in Cornwall. This time though, it was for real.

Thirty of us were experiencing Icelandic weather at very close hand - 65 hours of continuous, hard, rain! We were all members of the 1994 Brathay Exploration Group visit to Geithellnadalur - a deserted valley in south east Iceland. The objective of our trip was to undertake scientific fieldwork and climb some of the mountains.

The Brathay Exploration Group was founded in 1947 and is a non-profit making company which gives young people and their leaders the opportunity to increase their environmental and cultural understanding through adventure, exploration, and personal development projects in the UK and throughout the world.

The Project

I was very fortunate to be asked to join the expedition as the logistics leader. However, as a scientific expedition I also needed a fieldwork project to complete - and that's where weather satellites come in. I figured that it would be very interesting to take a system with me for several reasons:

- pictures of the Arctic region far beyond those obtainable from the UK can be received;
- there is a greater opportunity to take pictures since the polar orbits mean that they pass overhead far more often than in the UK;
- weather satellite pictures of the more populated parts of the globe are common since many people receive them. Arctic images are much rarer;

- receiving stations are traditionally major items of equipment installed in buildings and mains powered. I am not aware of any experience of the use of a battery operated lightweight system in a remote, mountainous environment;

- a modest meteorological station was to be established in the valley to assist with other fieldwork projects. Local observations could be enhanced by weather satellite images showing the wider picture.

Equipment

There were 4 major constraints when deciding what equipment to take:

1. Weight: the system must be light enough to take into the field and easily portable by one person once there;

2. Ruggedness: sufficient to cope with the rigours of operating in a remote, mountainous environment.

3. Power Supply: no mains power was available.

4. Equipment Availability: what could I lay my hands on?

Given the high latitude location there was no point receiving Meteosat, and anyway this would have produced results identical to those obtained from a UK location. Polar-orbiters (the NOAAs and Meteors) were what I wanted. A standard receiving station consists of an antenna to receive the signal from the satellite, a radio receiver to tune into and demodulate the signal, a personal computer to decode, display and store the image and a printer to produce a hard copy.

Reluctantly, I decided that it would not be possible to take a personal computer on the expedition. I was concerned about power supply problems and I wasn't sure who I could persuade to lend me a lap-top for use on a damp mountainside for three weeks! Images were therefore received and demodulated in the standard way and then stored on standard audio cassettes. I would decode the tapes on my YU3UMV framestore upon return to the UK. The disadvantage of this system was that no pictures could be seen in the field and there was no means of knowing whether the results were successful.

The following equipment was gathered together:

- RIG crossed-dipole VHF antenna which folds to a convenient size when not in use.

- Dartcom VHF scanning receiver built into a small, rugged box with all non-essential controls removed. This was packed in Jiffy bag.

- Panasonic RQ-2102 portable cassette recorder. This has a fixed recording level and was packed in its original box.

- Batteries for the cassette recorder + complete set of spares

- 3 TDK AR90 + 3 Boots SFI90 audio cassettes

- 2 Ever Ready PJ996 (6V/5.76Ah) batteries for the radio receiver + spares

The total weight of the equipment was approximately 7kg and it suffered no damage in transit either to or from Iceland.

A friend printed the NOAA satellite prediction tables for the basecamp location. I was surprised by the number of passes available, with around 40 occurring between 7am and 11pm each day. The majority of these were predicted to last over 10 minutes. We didn't print out the overnight ones as the prediction tables would have been far too long!

In the field

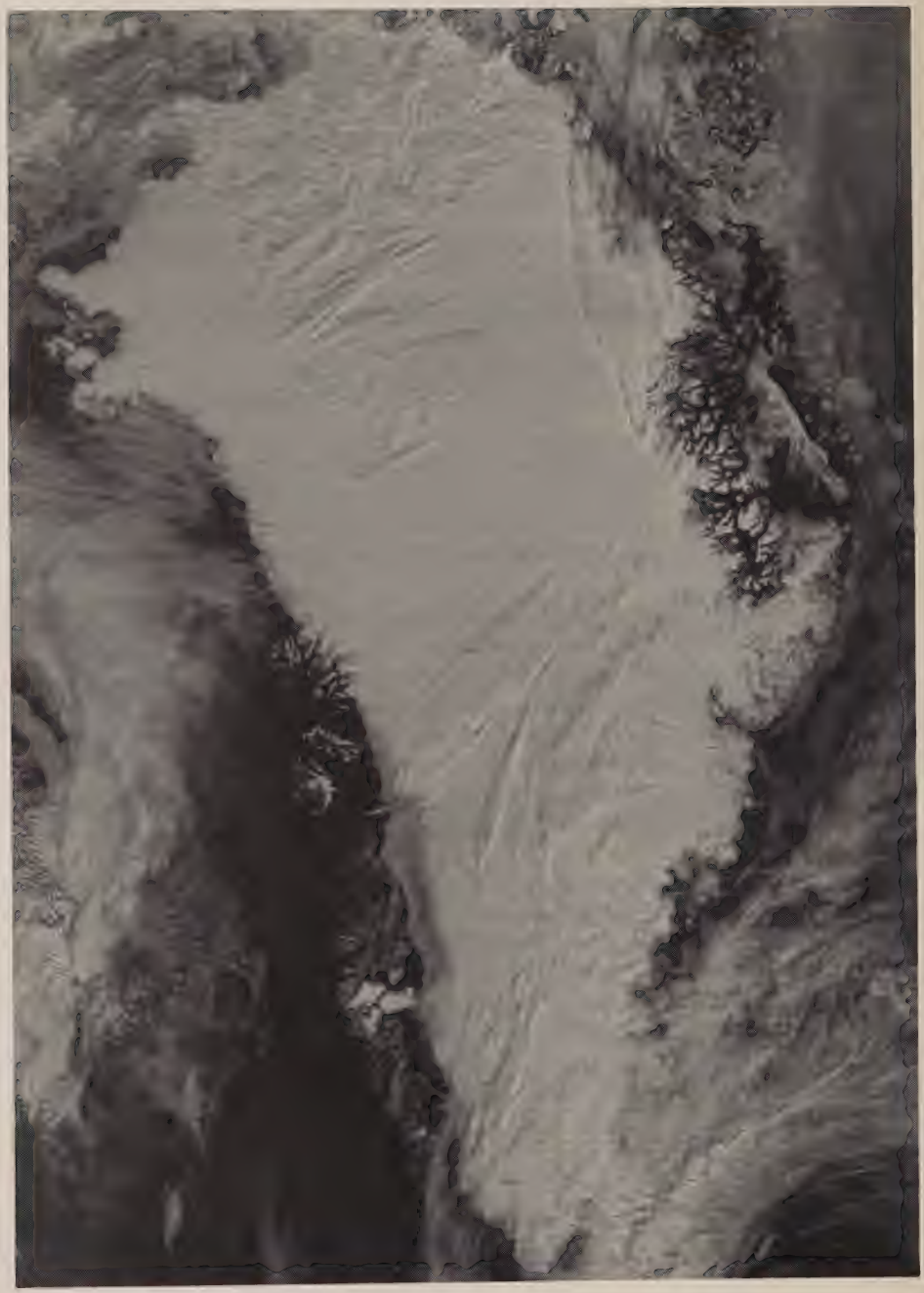
Once in the field the station was set up in the corner of a tent at the basecamp with the antenna mounted on a pole about 1.5m above ground level. The base camp itself was located at an altitude of approximately 150m in the bottom of the deep, U-shaped Geithellnadalur valley in S.E. Iceland (location: 14°50'W 64°35'N). The valley sides rose to a height of 800-1000m.

It was from this vantage point that most images were received but the valley location of the station restricted the duration of signal reception. This was not surprising although a little disappointing since I was hoping that the low elevation passes would provide the best views of the polar region.

On one day I persuaded some of my fellow expeditioners to carry my equipment in their rucsacs up the valley sides onto a plateau (altitude 800m) with a much better view of the horizon. Three overhead passes were taken from this location and these lost almost none of the pass in the south and a only a few minutes in the north.

Method of Operation

The predictions were used to select suitable passes to record. To save battery power



the receiver was switched on and tuned immediately prior to the pass start time. Once the satellite was within range and a clear signal received the tape recording started. A small earphone was plugged into the tape recorder to check that it was receiving the signal and a brief part of the pass replayed after it had ended to check that the recording had been successful.

Results

The following satellites were successfully received: NOAAs 9, 10, 11, 12 and Meteor 3-5.

Upon my return to the UK my old framestore developed a "stripy screen" fault so I was unable to produce satisfactory images on that. I was very fortunate in having a friend who volunteered to decode the images on his BAe/Dartcom system.

A technical problem with slightly variable recording level on the cassette recorder caused a banding problem on all NOAA images. The Meteor ones were unaffected and some stunning images were received. The accompanying image illustrates a rare, almost cloud-free Greenland taken by Meteor 3-5 on 18 July 1994 at 1425-1435 UTC.

The banding on the NOAA images, whilst not making them unusable, did significantly reduce the quality. Unfortunately, I had to purchase a new recorder immediately prior to the trip and had insufficient time to test it thoroughly.

26 satellite passes were successfully recorded of which 23 were from NOAAs. Three C90 cassettes were used and none of the spare batteries were required.

Discussion and Conclusions

Superb images of the Arctic region have been received although there would have been many more had the NOAA banding problem been resolved prior to the trip. The equipment proved light and robust enough to cope with the rigours of the trip.

A future expedition could enhance the equipment by taking a portable personal computer powered by a wind generator. Careful attention must be paid to station location to maximise reception in mountainous areas.

Acknowledgements

The author would like to thank Mr C.G. Roberts of the Halesowen Climate Station for producing the satellite schedules, decoding and printing the images and for his support and encouragement. Also, Mr H. Hardarson of the Icelandic authorities

for granting the requisite licence. (Cost £24 sterling. Address: Fjarskiptaeftirlit Ríkisins, Malarhofdi 2, IS-150, Reykjavík, Iceland). And finally, Mr A.P. Carvell of the Brathay Exploration Group for the opportunity to conduct this project and the other expedition members for their assistance with it.

INDIA LAUNCHES IMAGING SPACECRAFT

The second developmental launch of the Indian Polar Satellite Launch Vehicle (PSLV) took place on 15 October from the Sriharikota Range and successfully placed the Indian Remote Sensing Satellite, IRS-P2, into the intended sun-synchronous orbit at a height of 800 km. The orbit is such that the ground track repeats after 24 days.

IRS-P2 carries a Linear Imaging Self Scanner (LISS-II) camera which uses a push-broom scanning system using a CCD array. It has a spatial resolution of 32m across track and 37m along track and the swath width is 131km. The camera operates in four spectral bands in the visible and near IR regions; 0.45-0.52, 0.52-0.59, 0.62-0.68 and 0.77 to 0.86 micrometres.

The spacecraft has a mass of 870 kilogrammes and is 3-axis stabilised. It has two deployed solar panels totalling 6.42 square metres which together generate 510 W of power. There are also two 21 Ah Ni-Cd batteries on board.

I am grateful to Mr MYS Prasad, ISRO Technical Liason Officer at the Indian Embassy in Paris for arranging for information on this satellite and the image on the inside back cover to be sent directly from India in time to meet our press deadline. Ed.

MEMBERS' ADVERTISEMENTS

Members may advertise surplus equipment etc. for sale in the Journal free of charge but subject to space being available. Advertisements should be concise and must be for goods relevant to RIG activities. They should be submitted to the Journal Editor and not the Advertising Manager.

FOR SALE, MUST CLEAR. Dartcom APT polar/geostationary system for PCs comprising micro controlled receiver and down-converter, DSP interface, cables and software (includes Landsat disks). A 'Professional' system. Suitable for Western Digital SVGA chipset graphics cards only. As new. £760. Phone Paul G4XHF (evenings) on 01293 515201

AN ANTENNA PRIMER

John Boyer

Introduction.

Antennas are probably the most crucial part of any radio system. Yet we continually see that they are often ignored, misunderstood and all but forgotten. We all do it. I must myself confess to spending hundreds of pounds on interfaces and receivers and I spent less than 50p on my antenna! Yet without an efficient antenna the rest is useless. There are many misunderstandings with antennas, which I will try to explain. Such as what is antenna gain? Why antenna gains are sometimes quoted as 'dBi' and other times as 'dB'. What circular polarisation is and why it is used. Why are antenna matching and baluns so important?

Antenna Gain

There is a fictitious antenna that some may of heard of called an isotropic radiator. This is an antenna that radiates equally well in ALL directions. If you plot out its radiation pattern as a 3D drawing it would look like a sphere. Now take a well known antenna such as a horizontal half-wave dipole. It has a horizontal radiation pattern that looks like two balls stuck together as in Figure 1. The half-wave dipole does not radiate equally in all directions so it has directionality or gain.

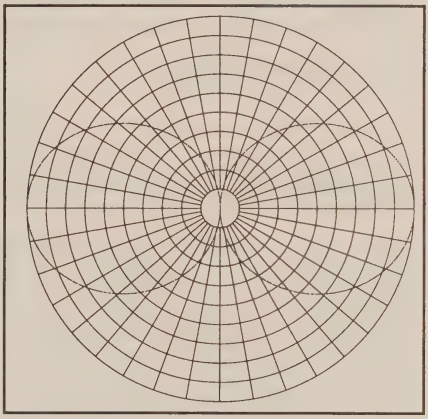


Figure 1.

The burning question now is how much gain? If you put the dipole pattern inside that of the isotropic radiator you can see that they both have the same maximum radiated power, but differing average radiated powers. If you measure the volume inside each pattern then the ratio between these is the gain. The average value for the isotropic radiator (normalised to it's maximum) is of course 1. The average of the half-wave dipole is around 0.6. If you take the ratio of these then you have a figure for the gain of a half-wave dipole with respect to an isotropic radiator. The text-books say something along the lines of 'The ratio between the maximum power density on the sphere and the average power density from the antenna'. If you perform this small conversion to log then you can express the gain of a half-wave dipole in dBi.

$$Gain(dBi)=10Log_{10}(Maximum\ Power/Average\ Power)$$

Sometimes people quote gains in dBi and other times without the 'i'. The difference is the reference antenna. The 'i' stands for isotropic, as in the theoretical aerial called an isotropic radiator that radiates equally in all directions, as already mentioned. Without the 'i' it is usually assumed that the gain is calculated with respect to a half-wave dipole, and very, very ocasionally some people will even write dBd for gain with respect to a half-wave dipole. We can see from the radiation pattern of the half-wave dipole that it has gain with respect to an isotropic radiator so any gain figures that use a half-wave dipole as a reference are smaller. It's like saying 'my car does 180'. Does 180 what? Feet per second? Miles per week? It is really important to understand what things are referenced against. Antenna manufacturers often quote gain figures with respect to an isotropic radiator because it looks better to the uninitiated. The gain of a half-wave dipole over an isotropic radiator is 2.17 dBi. Note the use of dBi, because the reference antenna is an isotropic radiator.

Circular Polarisation (c.p.)

Most of you, I hope, have an idea what horizontal and vertical polarisations are. The wave wiggles either on its side or on its edge. That's an extremely simplistic way of putting it, but the concept is there. Much like polaroid sun glasses.

If you take a half-wave dipole and spin it like a propeller then you get a rotating linear polarisation. Sometimes it's vertical. Sometimes it's horizontal and more often than not it's somewhere in between. Starting to sound familiar? Right, but it's still not c.p. However, if you rotate the dipole at the same rate as the frequency being transmitted then your radio wave becomes circularly polarised. You would have to rotate a 137 MHz dipole 137 million times a second. Wow! 8220 million r.p.m, some rotator! I'll take three. Or you could imagine an Archimedes screw with a pitch the same wavelength as the wave we are transmitting coming out of the antenna at the speed of light! Obviously, it isn't practical to generate c.p by physically rotating the antenna so, being into electronics, we do it electrically. Now sit down quietly and re-read this bit if necessary, as you nearly have the concept of circular polarisation.

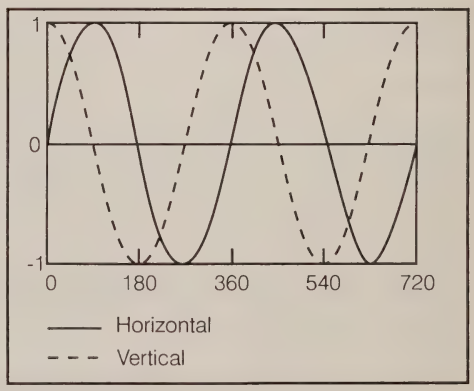


Figure 2.

What happens if we generate horizontal polarisation and vertical polarisation separated by a phase shift of 90 degrees and add them together in one antenna? Taking a look at the Figure 2 we can see

that when the h.p is a maximum, the v.p is at zero and vice versa. What is happening is that, as time progresses, the two waves alternate between 1 and -1. If we add these together vectorially, which means taking into account the relative phase of each wave, then the amplitude is always 1 with a changing phase. Imagine a right-angled triangle whose horizontal and vertical sides are changing between 1 and -1 and, in consequence, the slope of the hypotenuse changes, but not its length. So we have this wave that rotates its polarisation at the same rate as the frequency being transmitted, but always has a maximum value of 1. Hence we have generated circular polarisation.

The definition of circular polarisation is something along the lines of a radio wave comprising two orthognal polarisations with a 90 degrees phase shift between them. If one polarisation lags then you have right-hand circular polarisation and if the other lags then left-hand polarisation. Don't ask me which is which, as I always spend ten minutes making little drawings of sine waves because I can never remember.

Why bother with circular Polarisation?

You may now be wondering why on earth we go to all this trouble to generate c.p. What are we gaining (if you'll pardon the pun)? The answer lies in what happens to circular polaristion when it is reflected. Any circularly polarised wave that is reflected has its sense changed. Right-hand circular polaristion becomes left-hand and vice versa. This is really good news because one big problem that we often suffer from is multipath propagation. Multipath propagation is nearly always refered to as 'multipath' and occurs when the radio wave gets from the transmitter antenna to the receiver aerial by more than one route. The multipath is often caused by ground reflections or reflections off buildings and, more often than not, subtracts from the wanted (direct path) signal. Circularly polarised antennas reject the wrong sense polarisation. It's like trying to turn a corkscrew the wrong way. It therefore provides a degree of protection against multipath.

Baluns and Matching

We try (try definitely being the operative word here) to match the impedance of the antenna to the receiver/transmitter/coax for one very important reason. That reason is MAXIMUM POWER TRANSFER and, let's face it, that's what it's all about. Getting the maximum signal into our receivers or out of our transmitters and into the ether.

It is possible to prove that if you have a load that has the same impedance as the source then you get this marvelous maximum power transfer. I used to be able to do this, but it's now gone the way of a lot of those things that you learn at college. This

is why we try to make the impedance of an antenna as close as possible to that of the rest of our system. How to achieve it is, of course, very much harder. There are lots of techniques that I won't go into here.

The main problem most people will have with matching antennas is measuring its impedance. Those of us who are very fortunate, just bung it on a device called a network analyser. Network analysers look at the phase and amplitude of signals reflected back down the coaxial cable, and then draw a nice graph. The rest, well forget it. It is just too hard. Use someone elses design.

Most antennas are balanced devices. That is, they need feeding symetrically. If we take a half-wave dipole and feed it unbalanced (with coaxial cable, see Figure 3) then what happens is that the current goes up the inner core of the coax and uses the outer sheath of the coax as a return path. You might ask "What's wrong with that?". The answer is quite simply that return path current produces radiation/ reception from the outer conductor of the coaxial cable and the coaxial cable then behaves like an antenna. The receive system is then very vulnerable to picking up local radiations, such as might come from a computer sited near the receiver.

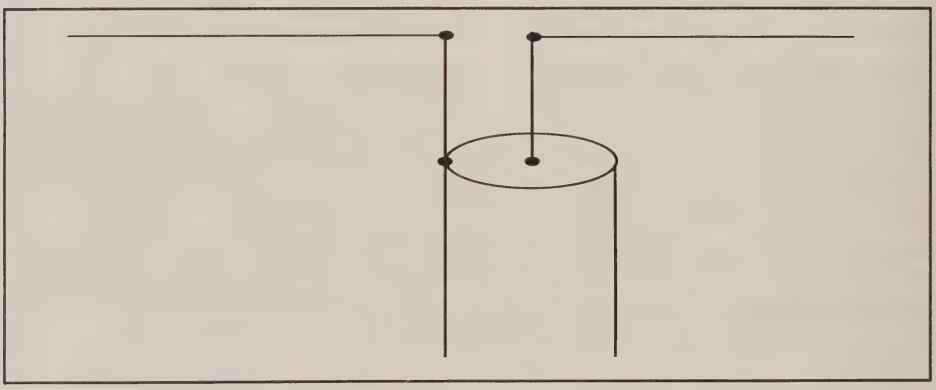


Figure 3.

What is supposed to happen is that the currents going up the transmission line should cancel out, but what happens when the half-wave dipole is fed unbalanced is that the signal on the inner conductor cannot radiate and thus cannot cancel the signal on the outer conductor of the coaxial cable. So what you do is, as far as the RF is concerned, is provide a current to cancel the current running down the outer conductor. The word balun is short for balanced to unbalanced transformer, and these can actually take the form of a little toroidal transformer. Don't bother to try to wind your own except at very low frequencies as it is a very black art indeed. It is, however, fairly easy to make a balun out of transmission lines.

Some types of balun produce impedance transformations themselves. For instance, the article in RIG 37 describing the construction of a quadrifilar helix used a slot balun to connect coax to a balanced antenna, and that particular balun has the added advantage that it produces an impedance transformation of 4:1. So if our antenna had been a folded dipole then this would have been ideal.

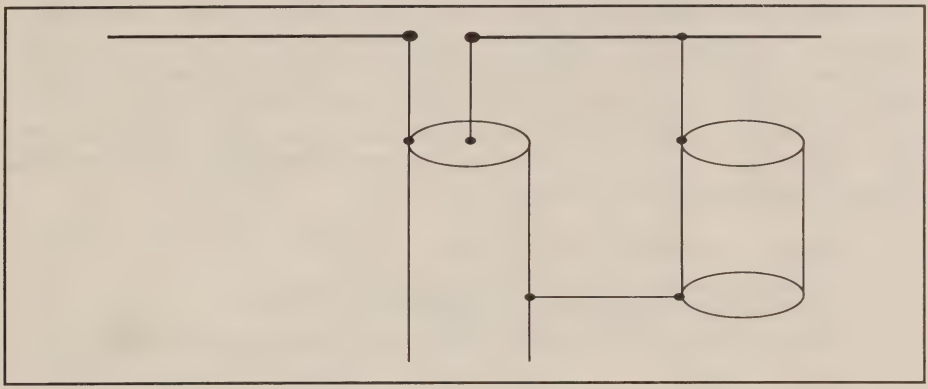


Figure 4.

There are quite a few designs of balun and one very common design is called a Pawsey Stub. This provides a 1:1 impedance transformation which makes it ideal for use with half-wave dipoles which have an impedance of 73 ohms. The Pawsey Stub as seen in Figure 4 can be made just as shown, or with two pieces of copper tube, each a quarter wave long, with the coaxial cable coming up the inside of one of the quarter-wave tubes. The feed arrangement is the same at the top and the tube provides support for the half-wave dipole. In practice, what happens is the tubes are made longer than a quarter wavelength and the short at the bottom is adjusted under test. If you visit a FM radio transmitter site and gaze up the mast it is possible to see this arrangement used to feed and support crossed dipoles. The way a Pawsey Stub works is that we need to use the current from the half of the half-wave dipole that is connected to the centre of the coaxial cable to cancel the current flowing down the outer conductor. One very obvious way is to short the inner and outer together. Unfortunately, that would mean no radiation. However, if we use the arrangement in Figure 4 then the current from the inner leg of the dipole flows down the quater-wave stub and cancels that from the outer. The impedance transformation that the quarter-wave provides means that there is no short between the inner and outer of the coaxial cable and the antenna radiates.

Well that about wraps it up for a short antenna primer. I'd like to think that I could write a lot more, but the RIG Journal isn't big enough and I don't really think I'm really that smart. ⊕

DISCOVER - WEATHER SATELLITE IMAGES IN HRPT (High Resolution)

Jean-Claude Beneche - F1AIA
Reprinted by kind permission of 'MEGAHERTZ Magazine'
Translation by Ray Godden - G4GCE

The objects of this article are for you to share my experiences in this field and to demystify the digital techniques used by weather satellites. Articles about this subject are rather rare, and it is in gleaning from the sparse information in publications such as VHF COM and Weather Satellite Report from the USA that I have been able, little by little, to get a more precise idea of the parameters of the problem. I have used, as far as possible and bearing in mind my limited financial resources, equipment already in place:-

Antenna, METEOSAT 1.7GHz 20dB.
Down-converter, 1.7GHz - 137.5MHz, DK1VA type.
137.5MHz FM receiver, 50kHz bandwidth.
Computer, IBM PC compatible 25MHz 386SX, SVGA with 120Mb hard drive.

The set-up is typical of a station wishing to capture METEOSAT images of good quality and low noise level.

A point: if you actually can capture METEOSAT without noise in the image (that is to say small black dots on a white background) you can aspire to capture HRPT signals on 1689 or 1707MHz!

High resolution or HRPT (High Resolution Picture Transmission) is a mode of meteorological image transmission less well known than the analogue transmission mode (APT) that has been the subject of numerous articles in various amateur publications.

Without going into too much detail, the HRPT transmissions from NOAA have the following characteristics:-

Transmission frequencies:
1698MHz - even NOAAs (10-12), APT 137.5MHz
1707MHz - odd NOAAs (9-11), APT 137.62MHz

Transmission antenna polarisation:	Right circular
Carrier modulation:	Digital split-phase
Modulation index:	±67.3 degrees
Bit rate:	665,400/sec! 10 bits/word
Number of channels:	5

WEFAX formats disseminated from CMS Lannion: The figure illustrates the 'Z' (visible) and 'Y' and 'R' format areas as they would appear with the GOES-E satellite at its nominal position of 75°*W*.

34	D1	03	AIW	03	D1	09	AIW	09	C02	15	AIVH	15	C02	21	AIVH	21	C02	27	AIVH	27	C02	33	AIVH	33	D1	39	AIVH	39	D1	45	AIW	45	34
38	D3	03	AIW	03	D3	09	AIW	09	C03	15	AIVH	15	C03	21	AIVH	21	C03	27	AIVH	27	C03	33	AIVH	33	D3	39	AIVH	39	D3	45	AIW	45	38
42			AIW	03	E6	09	AIW	09	D1	15	AIVH	15	D1	21	AIVH	21	D1	27	AIVH	27	D1	33	AIVH	33	E6	39	AIVH	39			AIW	45	42
46					E7	09			D3	15	GMSC	12	D3	21	GMSB	18	D3	27	GMSA	24	D3	33	GMSB	30	E7	39	GMSB	36			GMSD	42	46
50					E8	09					GMSD	12	C1D	21	GMSC	18	C1D	27	GMSB	24	C1D	33	GMSC	30	E8	39	GMSC	36					50
54			LXI	03	E9	09	LXI	09	C2D	15	LXI	15	C2D	21	LXI	21	C2D	27	LXI	27/28	C2D	33	LXI	33/34	E9	39	LXI	39/40			LXI	45/46	54
58	D2	04	BIW	04	D2	10	BIW	10	D2	16	BIV	16	D2	22	BIV	22	D2	28	BIV	28	D2	34	BIV	34	D2	40	BIW	40	D2	46	BIW	46	58

HH	02				05				08				11				14				17				20				23				HH
MM	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	MM
2	D1	04	AIW	04	D1	10	AIW	10	C02	16	AIVH	16	C02	22	AIVH	22	C02	28	AIVH	28	C02	34	AIVH	34	D1	40	AIW	40	D1	46	AIW	46	2
6	D3	04	AIW	04	D3	10	AIW	10	C03	16	AIVH	16	C03	22	AIVH	22	C03	28	AIVH	28	C03	34	AIVH	34	D3	40	AIW	40	D3	46	AIW	46	6
10	TEST		AIW	04	ADMIN		AIW	10	C3D	16	AIVH	16	C3D	22	AIVH	22	C3D	28	AIVH	28	C1D	34	AIVH	34	TEST		AIW	40	ADMIN		AIW	46	10
14			ADMIN				TEST		TEST		BW	16	C4D	22	BW	22	C4D	28	BW	28	C4D	34	BW	34			GMSD	36			TEST		14
18													ADMIN		GMSD	18	TEST		GMSC	24	ADMIN		GMSD	30									18
22																																	22
26																																	26
30	D2	05	BIW	05	D2	11	BIW	11	D2	17	BIV	17	D2	23	BIV	23	D2	29	BIV	29	D2	35	BIV	35	D2	41	BIW	41	D2	47	BIW	47	30
34	D1	06	AIW	05	D1	11	AIW	11	C02	17	AIVH	17	C02	23	AV	23	C02	29	AIVH	29	D1	35	AIVH	35	D1	41	AIVH	41	D1	47	AIW	47	34
38	D3	05	AIW	05	D3	11	AIW	11	C03	17	AIVH	17	C03	23	AV	23	C03	29	AIVH	29	D3	35	AIVH	35	D3	41	AIVH	41	D3	47	AIW	47	38
42			AIW	05	E1	11	AIW	11	C5D	17	AIVH	17	E1	23	AV	23	C5D	29	AIVH	29	E1	35	AIVH	35			AIVH	41	E1	47	AIW	47	42
46			ATEST2		E2	11			C6D	17	ATEST2		E2	23	AV	23	C6D	29	ATEST2		E2	35	TEST				ATEST2		E2	47			46
50			ATEST2		E3	11			C7D	17	ATEST2		E3	23	AV	23	C7D	29	ATEST2				ADMIN				ATEST2		E3	47			50
54	CTH	04	LXI	05			LXI	11	CTH	16	LXI	17			AV	23	CTH	28	LXI	29/30			LXI	35/36	CTH	40	LXI	41/42			LXI	47/48	54
58	D2	06	BIW	06	D2	12	BIV	12	D2	18	BIV	18	D2	24	BIV	24	D2	30	BIV	30	D2	36	BIV	36	D2	42	BIW	42	D2	48	BIW	48	58

AIVH	HRI Full Disc IR & Half Res VIS	BIW	HRI European sector IR & WV	Cnn	WEFAX VIS Full Res
AW	HRI Full Disc WV	BIV	HRI European sector IR & Full Res VIS	CnD	WEFAX VIS Half Res
AV	HRI Full Disc Full Res VIS	BIVW	HRI European sector IR, WV & Half Res VIS	Dn	WEFAX IR
AIW	HRI Full Disc IR & WV	BW	HRI European sector WV	En	WEFAX WV
Lxx	Meteosat X-ADC relay transmission (uplinked by CMS Lannion)	ATEST1	HRI Test Pattern	CTH	WEFAX processed Cloud Top Height
		ATEST2	HRI Encrypted Test Pattern	CTOT	WEFAX Full Disc VIS
LXI	HRI format (odd slots contain IR data, even slots VIS,when available)			DTOT	WEFAX Full Disc IR
LZ,LR,LY	WEFAX formats			ETOT	WEFAX Full Disc WV
GMSx	GMS WEFAX relay transmission (uplinked by CMS Lannion, 5 bit resolution)			ADMIN	WEFAX Administration Message
				TEST	WEFAX Test Pattern

NOAA 9 PERIOD 101.92 MINS FREQUENCY 137.62MHz

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

10/12	10.19	20.09	12/01	09.53	19.44	14/02	09.27	21.00
11/12	10.06	19.56	13/01	09.40	19.31	15/02	09.14	20.47
12/12	09.52	19.43	14/01	09.27	20.59	16/02	09.01	20.34
13/12	09.39	19.30	15/01	09.14	20.46	17/02	10.30	20.21
14/12	09.26	20.59	16/01	09.01	20.33	18/02	10.17	20.07
15/12	09.13	20.46	17/01	10.29	20.20	19/02	10.04	19.54
16/12	09.00	20.33	18/01	10.16	20.07	20/02	09.50	19.41
17/12	10.29	20.19	19/01	10.03	19.54	21/02	09.37	19.28
18/12	10.16	20.06	20/01	09.50	19.41	22/02	09.24	20.57
19/12	10.02	19.53	21/01	09.37	19.28	23/02	09.11	20.44
20/12	09.49	19.40	22/01	09.24	20.56	24/02	08.58	20.31
21/12	09.36	19.27	23/01	09.11	20.43	25/02	10.27	20.17
22/12	09.23	20.56	24/01	08.57	20.30	26/02	10.14	20.04
23/12	09.10	20.43	25/01	10.26	20.17	27/02	10.00	19.51
24/12	08.57	20.29	26/01	10.13	20.04	28/02	09.47	19.38
25/12	10.26	20.16	27/01	10.00	19.51	01/03	09.34	21.07
26/12	10.12	20.03	28/01	09.47	19.38	02/03	09.21	20.54
27/12	09.59	19.50	29/01	09.34	19.24	03/03	09.08	20.41
28/12	09.46	19.37	30/01	09.21	20.53	04/03	10.37	20.27
29/12	09.33	19.24	31/01	09.07	20.40	05/03	10.24	20.14
30/12	09.20	20.53	01/02	10.36	20.27	06/03	10.10	20.01
31/12	09.07	20.39	02/02	10.23	20.14	07/03	09.57	19.48
01/01	08.54	20.26	03/02	10.10	20.01	08/03	09.44	19.35
02/01	10.22	20.13	04/02	09.57	19.48	09/03	09.31	21.04
03/01	10.09	20.00	05/02	09.44	19.34	10/03	09.18	20.50
04/01	09.56	19.47	06/02	09.31	21.03	11/03	09.05	20.37
05/01	09.43	19.34	07/02	09.17	20.50	12/03	10.33	20.24
06/01	09.30	19.21	08/02	09.04	20.37	13/03	10.20	20.11
07/01	09.17	20.49	09/02	10.33	20.24	14/03	10.07	19.58
08/01	09.04	20.36	10/02	10.20	20.11	15/03	09.54	19.45
09/01	10.32	20.23	11/02	10.07	19.57	16/03	09.41	19.32
10/01	10.19	20.10	12/02	09.54	19.44	17/03	09.28	21.00
11/01	10.06	19.57	13/02	09.40	19.31	18/03	09.15	20.47

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

10/12	06.56	16.42	12/01	07.00	16.47	14/02	07.05	16.51
11/12	06.32	16.18	13/01	06.36	16.22	15/02	06.40	16.26
12/12	06.07	17.34	14/01	06.12	17.39	16/02	06.16	16.02
13/12	05.43	17.10	15/01	05.47	17.14	17/02	05.52	17.19
14/12	07.00	16.46	16/01	07.04	16.50	18/02	07.08	16.54
15/12	06.35	16.21	17/01	06.40	16.26	19/02	06.44	16.30
16/12	06.11	17.38	18/01	06.15	17.42	20/02	06.20	16.06
17/12	05.46	17.14	19/01	05.51	17.18	21/02	05.55	17.22
18/12	07.03	16.49	20/01	07.08	16.54	22/02	05.31	16.58
19/12	06.39	16.25	21/01	06.43	16.29	23/02	06.48	16.34
20/12	06.14	17.42	22/01	06.19	16.05	24/02	06.23	16.09
21/12	05.50	17.17	23/01	05.54	17.22	25/02	05.59	17.26
22/12	07.07	16.53	24/01	05.30	16.57	26/02	05.34	17.02
23/12	06.42	16.28	25/01	06.47	16.33	27/02	06.51	16.37
24/12	06.18	17.45	26/01	06.22	16.09	28/02	06.27	16.13
25/12	05.54	17.21	27/01	05.58	17.25	01/03	06.02	17.30
26/12	07.10	16.56	28/01	05.34	17.01	02/03	05.38	17.05
27/12	06.46	16.32	29/01	06.50	16.36	03/03	06.55	16.41
28/12	06.22	16.08	30/01	06.26	16.12	04/03	06.30	16.16
29/12	05.57	17.24	31/01	06.02	17.29	05/03	06.06	17.33
30/12	05.33	17.00	01/02	05.37	17.04	06/03	05.42	17.09
31/12	06.50	16.36	02/02	06.54	16.40	07/03	06.58	16.44
01/01	06.25	16.11	03/02	06.30	16.16	08/03	06.34	16.20
02/01	06.01	17.28	04/02	06.05	17.32	09/03	06.09	17.37
03/01	05.36	17.04	05/02	05.41	17.08	10/03	05.45	17.12
04/01	06.53	16.39	06/02	06.58	16.44	11/03	07.02	16.48
05/01	06.29	16.15	07/02	06.33	16.19	12/03	06.37	16.24
06/01	06.04	17.32	08/02	06.09	17.36	13/03	06.13	17.40
07/01	05.40	17.07	09/02	05.44	17.12	14/03	05.49	17.16
08/01	06.57	16.43	10/02	07.01	16.47	15/03	07.05	16.51
09/01	06.32	16.19	11/02	06.37	16.23	16/03	06.41	16.27
10/01	06.08	17.35	12/02	06.12	17.40	17/03	06.17	16.03
11/01	05.44	17.11	13/02	05.48	17.15	18/03	05.52	17.19

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

NOAA 12 PERIOD 101.29 MINS FREQUENCY 137.50MHz

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

10/12	08.21	18.08	12/01	08.06	17.53	14/02	07.50	17.37
11/12	07.59	17.46	13/01	07.44	17.31	15/02	07.28	18.57
12/12	07.37	19.06	14/01	07.22	18.50	16/02	07.06	18.35
13/12	07.15	18.44	15/01	07.00	18.28	17/02	08.26	18.13
14/12	06.53	18.22	16/01	08.19	18.06	18/02	08.04	17.51
15/12	08.13	18.00	17/01	07.57	17.45	19/02	07.42	17.29
16/12	07.51	17.38	18/01	07.35	19.04	20/02	07.20	18.48
17/12	07.29	18.57	19/01	07.14	18.42	21/02	06.58	18.26
18/12	07.07	18.35	20/01	08.33	18.20	22/02	08.17	18.04
19/12	08.26	18.13	21/01	08.11	17.58	23/02	07.55	17.42
20/12	08.04	17.51	22/01	07.49	17.36	24/02	07.33	19.02
21/12	07.42	17.29	23/01	07.27	18.55	25/02	07.11	18.40
22/12	07.20	18.49	24/01	07.05	18.33	26/02	08.31	18.18
23/12	06.58	18.27	25/01	08.24	18.11	27/02	08.09	17.56
24/12	08.18	18.05	26/01	08.02	17.49	28/02	07.47	17.34
25/12	07.56	17.43	27/01	07.40	17.28	01/03	07.25	18.53
26/12	07.34	19.02	28/01	07.18	18.47	02/03	07.03	18.31
27/12	07.12	18.40	29/01	06.57	18.25	03/03	08.22	18.09
28/12	08.31	18.18	30/01	08.16	18.03	04/03	08.00	17.47
29/12	08.09	17.56	31/01	07.54	17.41	05/03	07.38	17.25
30/12	07.47	17.34	01/02	07.32	19.00	06/03	07.16	18.45
31/12	07.25	18.54	02/02	07.10	18.38	07/03	06.54	18.23
01/01	07.04	18.32	03/02	08.29	18.16	08/03	08.14	18.01
02/01	08.23	18.10	04/02	08.07	17.54	09/03	07.52	17.39
03/01	08.01	17.48	05/02	07.45	17.32	10/03	07.30	18.58
04/01	07.39	17.26	06/02	07.23	18.52	11/03	07.08	18.36
05/01	07.17	18.45	07/02	07.01	18.30	12/03	08.27	18.14
06/01	06.55	18.23	08/02	08.21	18.08	13/03	08.05	17.52
07/01	08.14	18.01	09/02	07.59	17.46	14/03	07.43	17.30
08/01	07.52	17.40	10/02	07.37	17.24	15/03	07.21	18.49
09/01	07.30	18.59	11/02	07.15	18.43	16/03	06.59	18.27
10/01	07.09	18.37	12/02	06.53	18.21	17/03	08.18	18.05
11/01	08.28	18.15	13/02	08.12	17.59	18/03	07.56	17.43

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

10/12	18.18	08.12	12/01	13.15	03.08	14/02	09.48	01.20
11/12	17.07	07.00	13/01	13.41	03.35	15/02	10.15	00.08
12/12	17.33	07.27	14/01	14.08	02.23	16/02	09.03	00.34
13/12	17.59	06.15	15/01	12.56	02.50	17/02	09.29	01.01
14/12	16.48	06.42	16/01	13.23	03.16	18/02	09.56	22.38
15/12	17.14	07.08	17/01	13.49	02.05	19/02	08.44	00.16
16/12	17.41	05.57	18/01	12.37	02.31	20/02	09.11	00.42
17/12	16.29	06.23	19/01	13.04	02.57	21/02	07.59	22.19
18/12	16.56	06.49	20/01	13.30	01.46	22/02	08.25	21.08
19/12	17.22	05.38	21/01	12.19	02.12	23/02	08.52	00.23
20/12	16.11	06.04	22/01	12.45	02.39	24/02	07.40	22.00
21/12	16.37	06.31	23/01	13.11	01.27	25/02	08.07	20.49
22/12	17.04	05.19	24/01	12.00	01.53	26/02	08.33	21.15
23/12	15.52	05.46	25/01	12.26	02.20	27/02	07.21	21.41
24/12	16.19	06.12	26/01	11.15	01.08	28/02	07.48	20.30
25/12	16.45	05.01	27/01	11.41	01.35	01/03	08.14	20.56
26/12	15.34	05.27	28/01	12.08	02.01	02/03	07.03	21.22
27/12	16.00	05.53	29/01	10.56	00.50	03/03	07.29	20.11
28/12	16.26	04.42	30/01	11.22	01.16	04/03	07.55	20.37
29/12	15.15	05.08	31/01	11.49	01.42	05/03	06.44	21.04
30/12	15.41	05.35	01/02	10.37	00.31	06/03	07.10	19.52
31/12	14.30	04.23	02/02	11.04	00.57	07/03	07.36	20.18
01/01	14.56	04.50	03/02	11.30	01.23	08/03	06.25	20.45
02/01	15.23	05.16	04/02	10.19	00.12	09/03	06.51	19.33
03/01	14.11	04.05	05/02	10.45	00.38	10/03	07.17	19.59
04/01	14.37	04.31	06/02	11.11	01.05	11/03	06.06	20.26
05/01	15.04	03.20	07/02	10.00	01.31	12/03	06.32	19.14
06/01	13.52	03.46	08/02	10.26	00.20	13/03	06.58	19.40
07/01	14.19	04.12	09/02	10.52	00.46	14/03	05.47	20.07
08/01	14.45	03.01	10/02	09.41	01.12	15/03	06.13	18.55
09/01	13.34	03.27	11/02	10.07	01.38	16/03	05.02	19.22
10/01	14.00	03.54	12/02	10.33	00.27	17/03	05.28	19.48
11/01	14.26	02.42	13/02	09.22	00.53	18/03	05.54	18.36

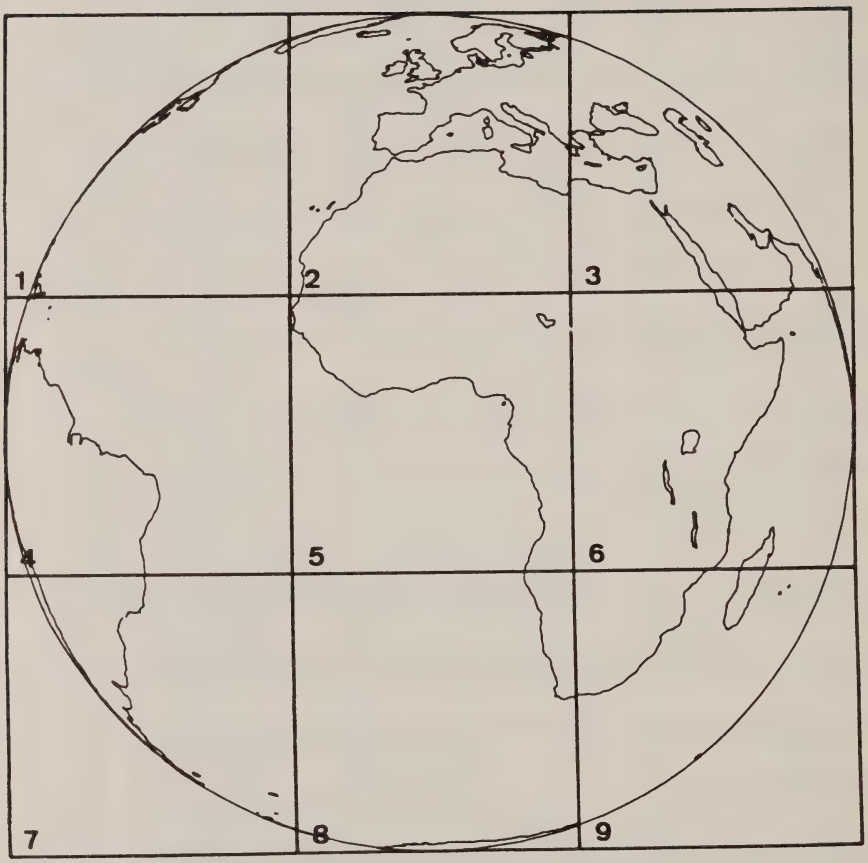
FIRST COLUMN PASSES ARE NORTHBOUND SECOND COLUMN PASSES ARE SOUTHBOUND

Dissemination Schedule S9410M02 - METEOSAT 5 (0 degrees W) FINAL

(Channel A1 = 1691 MHz - Channel A2 = 1694.5 MHz) Valid from 18 October 1994 (provisional)

HH	00				03				06				09				12				15				18				21				HH
MM	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	MM
2	D1	48	AIW	48	D1	06	AIW	06	C02	12	AIVH	12	C02	18	AIVH	18	C02	24	AIVH	24	C02	30	AIVH	30	D1	36	AIVH	36	D1	42	AIVH	42	2
6	D3	48	AIW	48	D3	06	AIW	06	C03	12	AIVH	12	C03	18	AIVH	18	C03	24	AIVH	24	C03	30	AIVH	30	D3	36	AIVH	36	D3	42	AIVH	42	6
10	D4	48	AIW	48	D4	06	AIW	06	D1	12	AIVH	12	D1	18	AIVH	18	D1	24	AIVH	24	D1	30	AIVH	30	D4	36	AIVH	36	D4	42	AIVH	42	10
14	D5	48	DTOT	48	D5	06	DTOT	06	D3	12	BW	12	D3	18	BW	18	D3	24	BW	24	D3	30	BW	30	D5	36	BW	36	D5	42	DTOT	42	14
18	D6	48	ETOT	48	D6	06	ETOT	06	D4	12	DTOT	12	D4	18	DTOT	18	D4	24	DTOT	24	D4	30	DTOT	30	D6	36	DTOT	36	D6	42	ETOT	42	18
22	D7	48			D7	06			D5	12	ETOT	12	D5	18	ATEST1		D5	24	CTOT	24	D5	30	CTOT	30	D7	36	ETOT	36	D7	42	ATEST1		22
26	D8	48	GMSA	48	D8	06	GMSA	06	D6	12	GMSA	12	D6	18	ATEST1		D6	24	LXI	23	D6	30	GMSA	30	D8	36			D8	42	ATEST1		26
30	D2	01	BIW	1	D2	07	BIW	07	D2	13	BIV	13	D2	19	BIV	19	D2	25	BIV	25	D2	31	BIV	31	D2	37	BIV	37	D2	43	BIW	43	30
34	D9	01	AIW	01	D9	07	AIW	07	C02	13	AIVH	13	C02	19	AIVH	19	C02	25	AIVH	25	C02	31	AIVH	31	D9	36	AIW	37	D9	43	AIW	43	34
38	D1	01	AIW	01	D1	07	AIW	07	C03	13	AIVH	13	C03	19	AIVH	19	C03	25	AIVH	25	C03	31	AIVH	31	D1	37	AIW	37	D1	43	AIW	43	38
42	D3	01	AIW	01	D3	07	AIW	07	C3D	13	AIVH	13	C8D	19	AIVH	19	C3D	25	AIVH	25	C8D	31	AIVH	31	D3	37	AIW	37	D3	43	AIW	43	42
46									C2D	13	AW	13	C9D	19	AW	19	C2D	25	AW	25	C9D	31	AW	31									46
50			GMSB	48			GMSB	06	D3	13	AW	13	C2D	19	AW	19	C1D	25	AW	25	D3	31	AW	31			GMSA	36			GMSA	42	50
54			LXI	01			LXI	07	D1	13	LXI	13	D1	19	LXI	19	D1	25	LXI	26/26	D1	31	LXI	31/32			LXI	37/38			LXI	43/44	54
58	D2	02	BIW	02	D2	08	BIW	08	D2	14	BIV	14	D2	20	BIV	20	D2	26	BIV	26	D2	32	BIV	32	D2	38	BIV	38	D2	44	BIW	44	58

HH	01				04				07				10				13				16				19				22				HH
MM	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	MM
2	D1	02	AIW	02	D1	08	AIW	08	C02	14	AIVH	14	C02	20	AIVH	20	C02	26	AIVH	26	C02	32	AIVH	32	D1	38	AIVH	38	D1	44	AIW	44	2
6	D3	02	AIW	02	D3	08	AIW	08	C03	14	AIVH	14	C03	20	AIVH	20	C03	26	AIVH	26	C03	32	AIVH	32	D3	38	AIVH	38	D3	44	AIW	44	6
10			AIW	02	E1	08	AIW	08	D7	14	AIVH	14	D7	20	AIVH	20	D7	26	AIVH	26	D7	32	AIVH	32	E1	38	AIVH	38			AIW	44	10
14			LY	01	E2	08	LY	07	D8	14	BW	14	D8	20	BW	20	D8	26	BW	26	D8	32	BW	32	E2	38	BW	38			LY	43	14
18			LR	01	E3	08	LR	07	D9	14	LY	13	D9	20	LY	19	D9	26	LY	25	D9	32	LY	31	E3	38	LY	37			LR	43	18
22			GMSC	48	E4	08	GMSC	06	D3	14	LR	13	D3	20	LR	19	D3	26	LR	26	D3	32	LR	31	E4	38	LR	37			GMSB	42	22
26			GMSD	48	E5	08	GMSD	06			GMSB	12			GMSA	18			LZ	25			LZ	31	E5	38	LZ	37			GMSC	42	26
30	D2	03	BIW	03	D2	09	BIW	09	D2	15	BIV	15	D2	21	BIV	21	D2	27	BIV	27	D2	33	BIV	33	D2	39	BIV	39	D2	45	BIW	45	30



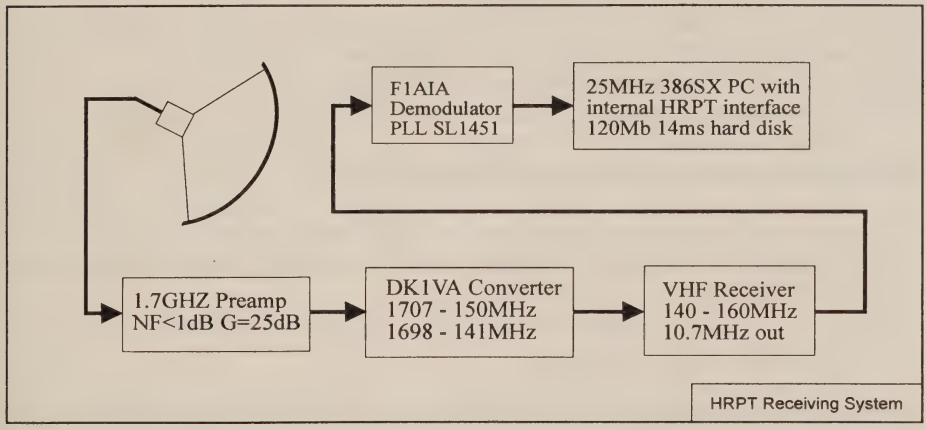
CnD, E, D-formats disseminated from ESOC: CnD-formats are from the visible channel, D-formats are from the infrared channel and E-formats are from the water vapour channel.

Channel wavelength characteristics (microns):

Channel 1	0.58-0.68
Channel 2	0.725-1.1
Channel 3	3.55-3.93
Channel 4	10.3-11.3
Channel 5	11.5-12.5

Resolution is 2048 pixels/line, each 10 bits deep (one can imagine the size of the stored images!).

Here I will stop describing the transmission and image parameters. I suggest you read the article by DL3WR (VHF-COM 02/92) for more details.



Equipment required for Image Capture

The constraints are severe enough and are summarised thus:

Antenna:	Minimum gain 20dB/dipole at 1.7GHz. Could be a Yagi with a minimum of 30 elements, or a 1 metre dish. Elevation and azimuth tracking of the antenna (automatic if possible but manual following is feasible).
Low-noise amplifier:	Minimum gain 20dB and Noise Factor less than 1dB.
Down-converter:	1.7GHz to 137MHz (same as for METEOSAT).
VHF Receiver:	140-150MHz, 1.5MHz bandwidth at -3dB (minimum), indispensable to pass the 665.4 kbit/sec signal.
I.F amplifier:	10.7 or 21.4MHz and PSK (Phase Shift Keying) demodulator, preferably PLL (Phase Locked Loop).
Computer:	IBM PC compatible, with hard disk drive and interface card.

For those who are not afraid of a soldering iron, I advise them to construct a YU3UMV type preamplifier. I have modified his design by replacing the original MGF1302 with a higher-performance ATF10135. The unit is very stable at Vds = 1.5V and Id = 20mA. (the AT10135 is available from Mainline Electronics). I have not been able to make an absolute measurement of the noise level, but comparing with sun noise shows a substantial improvement in Noise Factor and a 3dB increase in gain.

The Down-Converter

Type DK1VA, unmodified. The bandwidth of the input circuits is sufficient for reception from 1690 to 1710MHz. The converter's local oscillator was retained, resulting in the following output frequencies:

NOAAs 9 & 11 - 1707 MHz - local osc. = 150 MHz.
NOAAs 10 & 12 - 1698 MHz - local osc. = 141 MHz.
METEOSAT - 1694.5 - local osc. = 137.5MHz.

140-150MHz Receiver (BF900-5042-TDA1047)

I use a receiver originally designed for 137.5MHz, with a modified local oscillator to receive from 140 to 150MHz. I added to the I.F. 10.7MHz transformer a loading resistor of 3.3 kΩ.

The Remodulator (F1AIA design)

The task is entrusted to a PLL integrated circuit from Plessey, the SL1451, intended to decode video for satellite TV reception. Functioning at 10.7MHz poses no problems, only the filter has been modified (TV necessitates 25MHz of FM pass band). I was largely inspired by the Plessey application note for the device.

PLL demodulation gives a double advantage:

1) Best signal/noise performance, particularly with weak signals.
2) Almost total freedom from the effects of Doppler shift - the PLL oscillator being locked by the received signal.

The Line Driver

The raw data from the SL1491 are amplified by a pair of 2N918 transistors and passed to an HEF4049 CMOS chip which serves here as a line driver. Having three buffers in parallel allows the PC and receiver/demodulator to be connected by a dozen or so metres of screened-pair cable without problems.

The Interface and Software

I am using the Timestep interface for:

1) Its availability and cost.
2) Its non-critical functioning; in effect it is sufficient to feed raw data to the card at a level of 3 to 5V.
3) Its software which permits the construction of an image even if you lose acquisition of the satellite for an instant. The cost of the interface and software was £99 in 1993 (now £150 +VAT - translator).

The PC

A 286 is sufficient; it is more the capacity of the hard drive which limits the acquisition of images. Take, for example, a good NOAA 11 south-north pass in the afternoon of about 15 minutes duration: - One channel occupies 10Mb - the 5 channels simultaneously - 50Mb. Therefore a hard drive of capacity greater than this is necessary if you wish to capture an ensemble of all 5 channels simultaneously. Disk access time must be less than 40ms for a single channel and less than 18ms for 5 simultaneous channels.

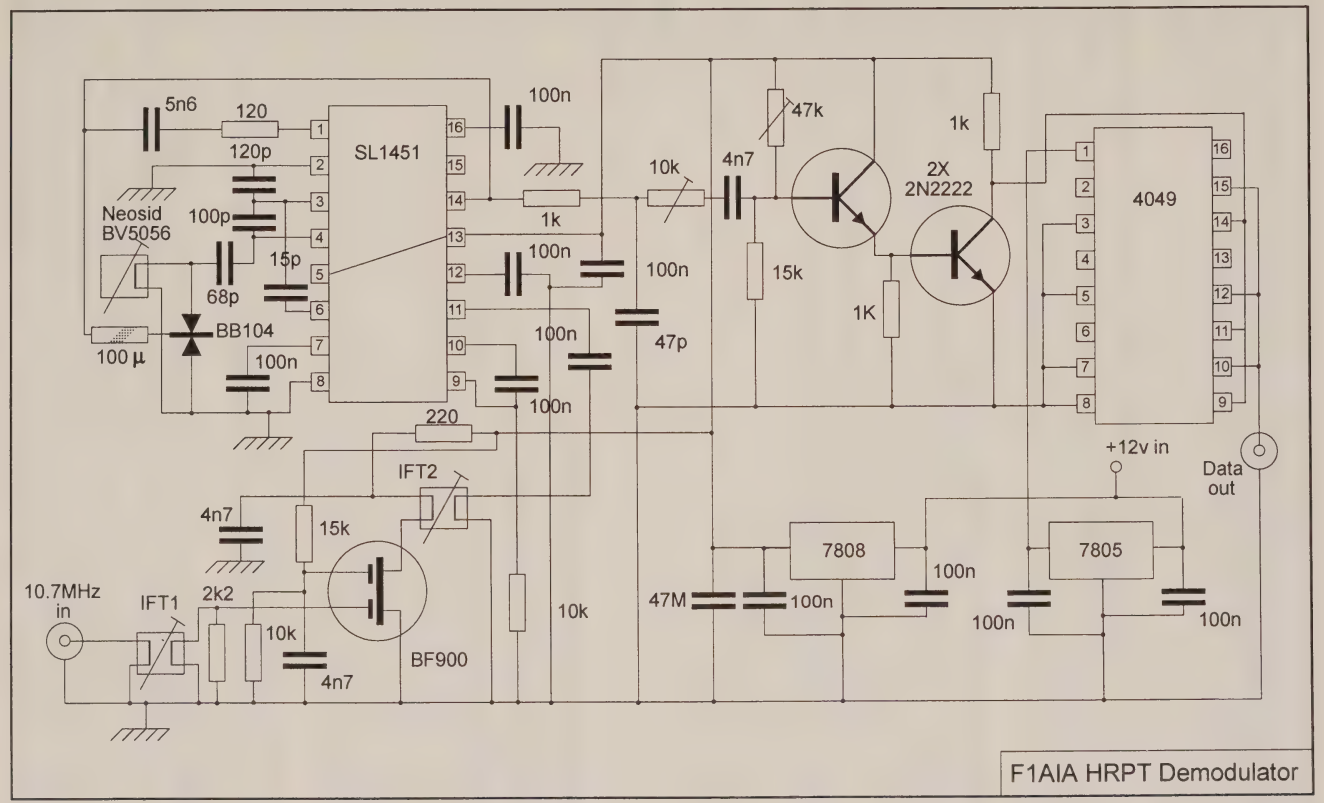
Software

Like most commercial FAX programs pull-down menus are selected by mouse or keyboard.
- SVGA up to 1024 X 768 (the majority of screen drivers are incorporated).
- Possibility of latitude and longitude gridding (up-to-date Keplers, less than a week old: PC clock must be precise).
- Colouring of images
- Saving in PCX or GIF formats.
- Direct indication of temperature on the infra-red image: 8 bits can be positioned within the 10 bits received (very useful to distinguish temperature variations in seas and oceans).
- False colour/temperature function.

Other utilities make this software high-performance and user-friendly. The program is protected by a 'dongle' plugged into the parallel port.

Conclusion

With this system I capture images from the Caspian Sea to the limits of Newfoundland and from Mauritania to the White Sea. The received images are saved in GIF format, archived and processed with 'Improcess 4', an excellent shareware pro-


5n6
120
120p
SL1451
100n
Neosid
BV5056
100p
15p
68p
BB104
100 µ
100n
1k
10k
4n7
47k
1k
2X
2N2222
15k
1K
4049
47p
220
IFT2
+12v in
Data
out
4n7
15k
7808
7805
10.7MHz
in
IFT1
2k2
10k
BF900
47M
F1AIA HRPT Demodulator

gram which truly merits registration ($25) with the author, J.Wagner.

My hope is that readers will be interested in this technique. I think it is the logical next-step after experience with METEOSAT or APT. It is an irreversible evolution; once you have had a taste of the magnificent images of our Earth in high-resolution all the rest appear insipid!

FIRST PART OF THE EQUIPMENT: THE DEMODULATOR

The demodulator is designed around the SL1451 integrated circuit developed by Plessey for TV signal demodulation, wide-band FM by satellite, but also wide-band digital signals; this gave me an idea! Characteristics of the SL1451: it is a PLL (Phase Locked Loop), ideal for decoding drifting signals due, for example, to Doppler. Compared to the well-known MC1496 it has a stable internal oscillator which makes for simplicity. It also has an AGC (Automatic Gain Control) function which is not used in this application. I have used this device with a 10.7MHz preamplifier, using a standard design incorporating a BF900 with a 10.7 IF transformer damped to obtain the necessary 3 MHz bandwidth. At the output we find a 1.3308 MHz (2 X 665.4 kHz) LP (Low Pass) RC (Resistor-Capacitor) filter composed of 1K and 47pF, followed by a pair of 2N2222, or equivalent, transistors for amplification and wave-shaping. A line driver using 3 sections of a 4049 in parallel allows the receiver to be separated from the PC by a distance of the order of 15m. At the end of this length of cable the 665 kbit signal is practically rectangular!

Adjustments are few and simple:

Check that the SL1451 oscillates well (frequency meter connected to pin 6, adjust the core for 10.7MHz).

Feed a digital HRPT signal to the input - 200 microvolts minimum.

Adjust the 10K and 47K variable resistors to obtain a symmetrical square wave at pin 11 of the 4049 (R1 sets the sensitivity and R2 the offset).

Using an oscilloscope connected to the demodulator output (47pF, 1K), adjust IFT1 and IFT2 for maximum waveform amplitude.

The quality of the signals is essentially a function of the S/N ratio of the receiving system and will degrade very rapidly as it deteriorates. A high gain antenna and a very low-noise preamplifier are required - this is where I announce that in the next issue there will be a description of my 1.3m mesh dish system with circularly polarised feed and low-loss coaxial match. See you soon - good constructing! ⊕

FIFTY YEARS OF WEATHER

John B Tuke

Having returned to copying the weather satellite images after a break of 15 years, I have been interested in the articles under headings like "How I became a Riglet" and reading how new-comers have overcome difficulties and have found themselves caught up in a very interesting side of the electronics hobby. In particular, the various reasons that interest arose in the first place are intriguing, but I have noticed that a desire to find out more about the general weather situation does not seem to figure largely. It is more often either the purely technical interest and achievement, or seeing the map-like images which fires up the enthusiasm.

My interest in the weather started back in 1940 when, thanks to dear Adolf, I found myself on the Island of North Uist, in the Outer Hebrides, working on a radio station. As I have no wish, even at this late stage, to end my days in the "Tower" let me just say that we were helping the war effort - or at least trying to. Having never been to the islands before and arriving one morning when the rain was horizontal instead of vertical, I soon came to the conclusion that the weather was something to be reckoned with. "If you can't beat 'em, join 'em" the saying goes, so I decided there and then to find out more about what made the weather tick. There were no weather broadcasts during the war and apart from learning by experience that when snipe dive to the ground with their wings making a whirring sound it will rain the next day, there was little prospect of doing much amateur meteorology at that time. I did start to keep records though and read books.

The end of the war found me back in the Islands after having spent a few years in England. I was now working on Benbecula airport and decided to try to find out more about weather and forecasting. The local Met. Officer was helpful and I started copying the Morse transmissions from the Met Office headquarters in Dunstable which enabled the construction of various charts, including the Atlantic area, which was the most useful to us. Does anyone reading this recall "66150" (warm front) and "66450" (cold front)? Probably not. Although interesting and informative, this must have been just about the slowest and most work-intensive way of obtaining distant weather information. Unfortunately, the amateur meteorologist can do little without knowing what is going on at a distance (usually to the west) and and this was the only way to get it. Some years later the coded messages were received by radio-teleprinter which saved some of the work but many hours still had to be spent if much information was to be obtained.

The next breakthrough came with facsimile. In the mid-fifties, I paid a visit to the Met Office at Dunstable and saw their fax transmissions. Here was the answer to my problem - build a fax machine! I will gloss over the problems which had to be overcome before that was satisfactorily accomplished but perhaps I should men-

tion the construction of a home-made 50 Hz tuning fork which was needed as a frequency standard. It entailed a little elementary steelwork in the sitting-room fire! Don't try it.

So to the mid-sixties when the weather satellites got going. However good the facsimile charts were, they were often many hours behind the observation time and lacked detail. When I first read about weather pictures, they seemed, at last, to be the answer to my quest for more and more detail about the weather around us. So - build a weather satellite receiving station! At least I had one of the essentials, a revolving-drum type fax machine, so all that was needed was a receiver, an aerial and some information. Get a book! There didn't seem to be any. I wrote to one of the technical magazines and asked for some details of the system, only to be told that it was a military secret and that I should drop the subject. Thinking that perhaps I was taking my life in my hands and might well end up incarcerated somewhere, I wrote to NASA. Their reply was most helpful and contained all the information I needed, including frequencies, details of picture transmissions, line speeds, IOCs and also a hope that my efforts to copy the weather satellite images might be successful.

The first receiver was, of course, a valve job with a 32MHz IF (no crystal filter needed in those days) and an adjustment was made to my home-made fax machine so that it responded to amplitude modulated video signals instead of frequency modulated ones. I had never dabbled in VHF before so I learned a thing or two along the way. It seemed from what little literature there was about space communications in those days that the only aerial that would give any results was the helix, so one of 8 turns was constructed. It was steered in azimuth and elevation by a system of ropes from indoors, "feedback" being along the lines of watch the S-meter and pull for maximum smoke. Eventually, a pre-programmed auto steering device was built working with a 25-way Uniselector and this worked well because the beamwidth of a helix is considerable. It took a bit of time to get right as the only satellites available were of the ESSA series which came over in the morning and, as they did not transmit in the dark, the ascending transmission was only available if there was enough daylight. In winter, even the morning transmissions did not commence until the satellite had descended to about 60N, so the UK just about came into the picture. The transmission system at that time was almost identical to standard fax where a previously scanned picture was transmitted following synchronising signals at the beginning.

The first pictures received were difficult to interpret as land forms were not very clear. One of the first I recognised was of Norway with its snow-covered mountains but there were days when the UK was quite clearly visible and, at last, the fronts and depressions took on a real meaning. A little later came the Nimbus series in which the continuous type of transmission in use today was introduced.

and this produced non-linear but very interesting pictures, so that if you looked closely along the edge of the picture it was quite easy to get the impression that you were in the spacecraft! Each time a satellite passed over a new modification was tried out and then either approved or rejected and thus the results slowly improved.

At about this time I sent some of my pictures to NASA and General Electric of Philadelphia, who built the Nimbus spacecraft, to see if they were anything like those received by professionals. Much to my surprise, they were highly thought of and, as a result, my wife and I were the guests of GEC for two weeks in the USA during which time I met not only many of the NASA and GEC personnel who were connected with the weather satellite programme, but also the vice-president of the United States. At the end of the fortnight we saw one of the Nimbus spacecraft launched from Vandenburg. That was quite a sight.

Upon returning home I decided to go in for optical/photographic reproduction of the images and used a mixture of home-made and redundant commercial machines suitably modified and there is no doubt that this produces images of the highest quality. However, it is a slow and laborious business and also expensive. It was not long before IR night time images were being produced and the first ones used some odd line speed around 44 lines per minute. I cannot remember the exact figure but I do recall that it necessitated the construction of a new tuning fork! Then came the geostationary satellite ATS-3 which transmitted in the 137 MHz band and gave some excellent global images.

In the late sixties and even the early seventies there was still only a small amount of general knowledge about the weather satellite system and for some time I gave talks and assistance to various amateur and also some professional groups who were interested in copying the weather images, even including (believe it or not) Dundee University!

For various reasons I ceased copying the images around the mid seventies and only returned to it a year or so ago. With so much additional information available by using a computer I decided this was the way to go and have been pleasantly surprised by the versatility of the system. I now use a Lindenbladt aerial, a Cirkit receiver and a very special home-made pre-amp and this combination gives horizon to horizon coverage without difficulty. I am screened to the north but cannot do much about that. Otherwise results are excellent.

Most of the old problems associated with obtaining weather data seem to have gone. Fax charts on HF or VLF are up-to-date and plentiful and there are numerous satellite images. Am I any better at forecasting the weather? I doubt it. Anyway, I can always watch the snipe! ⊕

THE RABAUL CALDERA ERUPTION

Peter Wakelin

The city of Rabaul, the third largest in Papua New Guinea, is situated on the rim of the sea-filled Rabaul Caldera on New Britain Island. In 1937 Mt Tavurvur, about 4 km away, erupted, buried the city under ash and killed more than 500 people. A new volcano, Vulcan, formed at the same time and is also about 4 km from Rabaul.

On 18 September 1994 increasingly strong earthquakes were felt in the area and a hasty evacuation of the 30,000 inhabitants of Rabaul began that evening. Just before dawn on the following day Mt Tavurvur began to erupt and at 0730 there was a massive explosion from Vulcan. By then, almost all of the inhabitants of Rabaul had been moved to safety. Over the next couple of days well over a metre of ash was deposited on the city and it was reported that part of the airport and the whole of Matupit Island had disappeared under the sea. As many as five separate vents were active at the height of the eruption. Surprisingly, there were also reports of widespread looting taking place in Rabaul throughout the eruption.

Many of the old people who remember the 1937 eruption said this one was much worse and believe that Rabaul should be relocated.

"The Mercury", a Hobart, Tasmania, newspaper carried an interesting note that during the time of Japanese occupation of Rabaul in World War II, Australian and American forces tried to initiate an eruption by bombing the craters. The bombs found their targets but did not have the desired effect!

There were no satellites to monitor the 1937 eruption but, 57 years later, images of this event were available to the entire world very rapidly. The sequence of images from the GMS-4 satellite show the rapid spread of the plume during the first few hours hours following the eruption. More images from this sequence, and other images, appear on GIF Library disk 134. The stereogram was produced by the University of Illinois from aerial photographs of Mt Tavurvur taken in 1944 from a height of 20,500 feet (6,250m). To obtain a three-dimensional view of the volcano, orientate the image correctly (top left is marked), focus on the centre of the image and then relax your eyes and try to re-focus at about double the distance of the image. If you are not used to stereograms it may take a little time to get the 3-D effect but it is worth perservering.

I am grateful to numerous people for making this information available on Internet but special thanks go to Dr Kevin Vang, School of Earth Sciences, The Macquarie University, Sydney, Australia and David J Schneider at Michigan Technological University, USA. ⊕

GMS-4 IR 18SEP 1994 2230 UT

GMS-4 IR 19SEP 1994 0230 UT

GMS-4 IR 19SEP 1994 0730 UT

TOP LEFT

SMALL BLUE PLANET - A CD-ROM REVIEW

Les Hamilton

Recently, I spotted an interesting advert in a copy of EARTH magazine for a CD-ROM entitled Small Blue Planet. It contains views of Earth taken from the Space Shuttle as well as from Earth-orbiting satellites. I sent off for the disk on 30 September and it arrived on 14 October. Payment was $49.95 by MASTERCARD (even though the advert made no mention of credit card payment facilities).

Although the general bias of the disk is strongly focused on the US, it claims to be a Real Picture Atlas of the World, and does indeed include a wide range of images from all over the globe. In addition to a dozen or so high-altitude aircraft views and a similar number of images from Landsat MSS, Landsat Thematic Mapper, DMSP and NOAA AVHRR, there are also 64 USGS aerial views of cities (all USA) and 73 Space Shuttle photographs (world-wide). Finally, there is a group of miscellaneous thematic images, including composite satellite images of all the continents, relief maps of USA and Italy as well as a South Polar ozone map.

The user interface is easily mastered, and includes a control panel from which 'red dots' may be called up on a map of the Earth. When clicked on, each shows first a thumbnail satellite image, which expands full size on double-clicking. Some of the image files extend to many megabytes and can be zoomed into several times. Clicking on a compass rose allows speedy movement around the images. There is also a facility to copy selected areas of most images to the clipboard for processing, or saving in applications like Paintshop Pro.

It should be notes that the majority of the images have been selected for their absence of cloud, in line with the atlas concept of the disk. Nevertheless, Small Blue Planet is a fascinating collection of images, each of which is accompanied by text, which can be called up on clicking a query (interrobang!) symbol on the control pad.

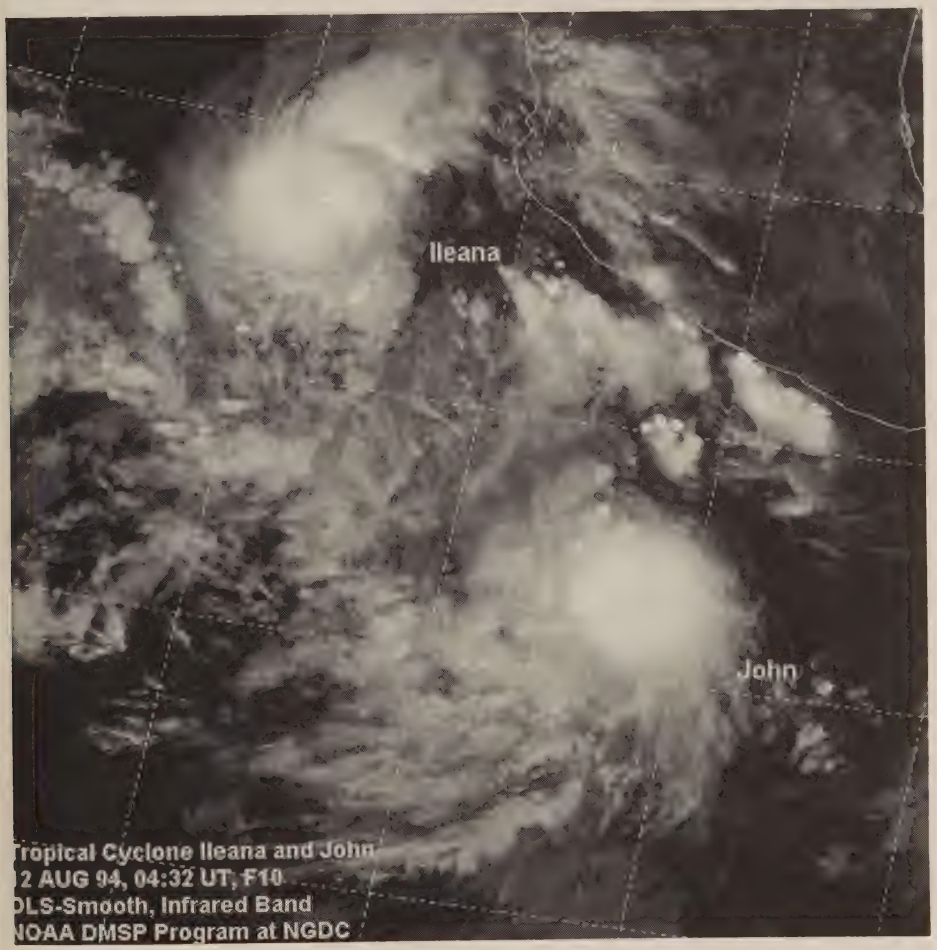
Also included in the package is the Chronosphere, which shows day and night over the planet, with both an animated world map and a spinning globe. Just click the mouse over Britain, and the correct time is set, and the Sun's shadow repositioned to show the current positions of day and night worldwide.

Finally, a Political World map is available. Clicking the cursor on any country reveals a browser with extensive statistical, historical, landscape and ecological information.

Small Blue Planet normally retails at $79.95, but is available at the discount price of $49.95 on mentioning EARTH Magazine. Suppliers are Now What Software, 2302 Sacramento, San Francisco 94115, USA. Mac and Windows versions are available. ⊕

HURRICANE JOHN BREAKS RECORD

John developed over the warm waters of the eastern Pacific Ocean off the coast of Mexico on 11 August 1994 and travelled several thousand kilometres during its record-breaking 30 day life. The previous record was 27.25 days set by Atlantic Hurricane Ginger in September/October 1971. During John's life, 14 other tropical cyclones formed and died. This image of John, early in its life, was received from the DMSP 2-06 satellite and also shows Ileana. This information was taken from Tropical Cyclone Weekly Summaries issued by the Department of Meteorology at Florida State University and the image is courtesy Greg Deuel at the DMSP satellite archive, NGDC, NOAA. ⊕

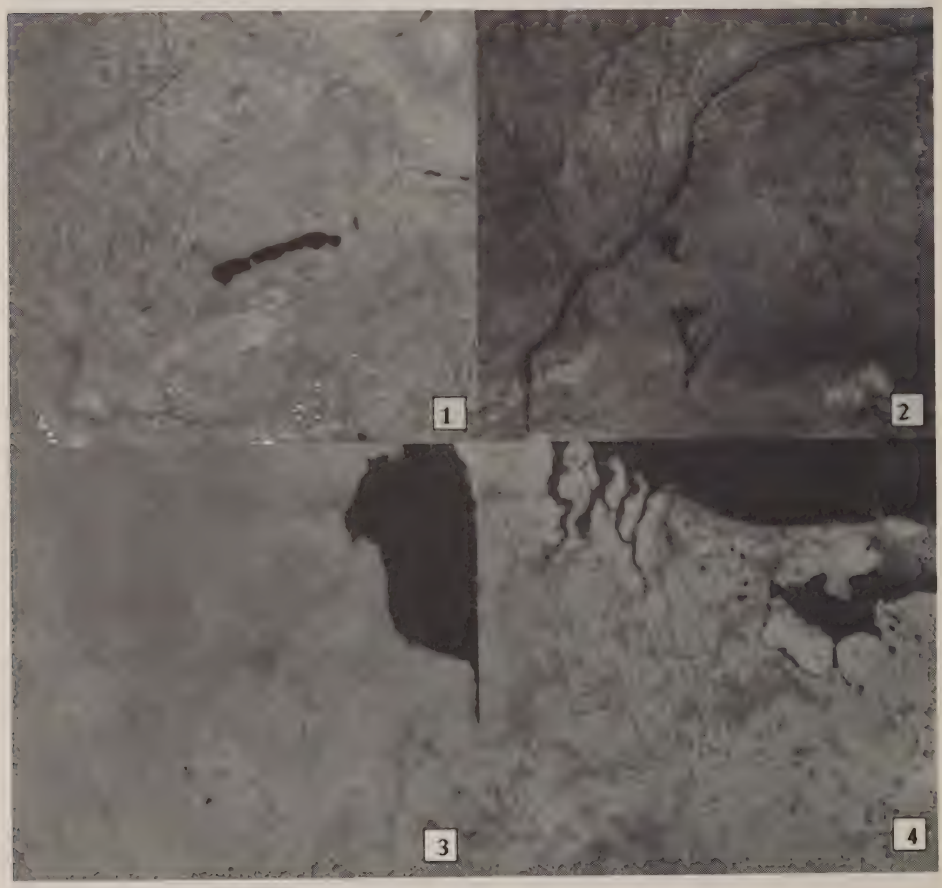


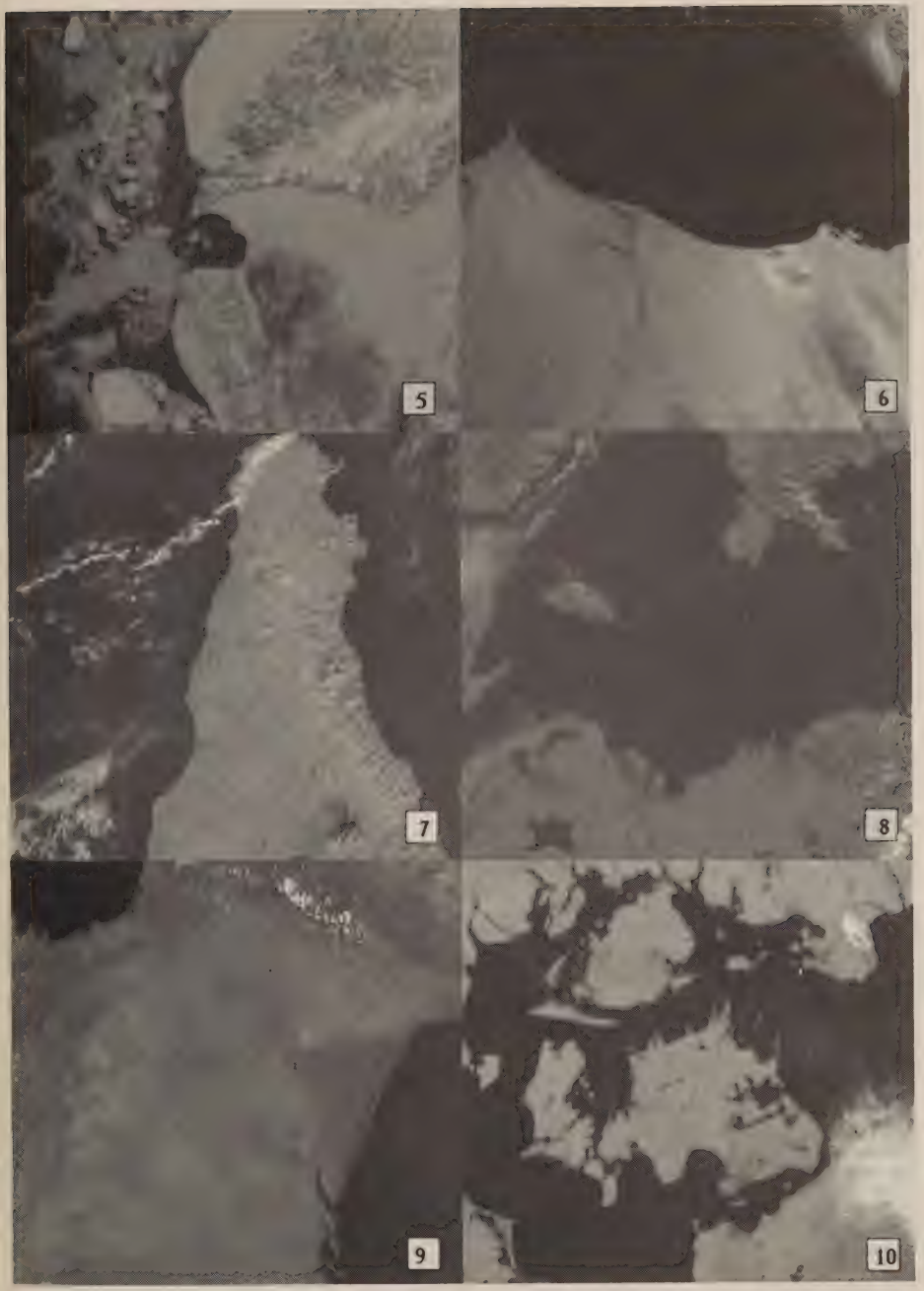
HOW GOOD IS YOUR GEOGRAPHY?

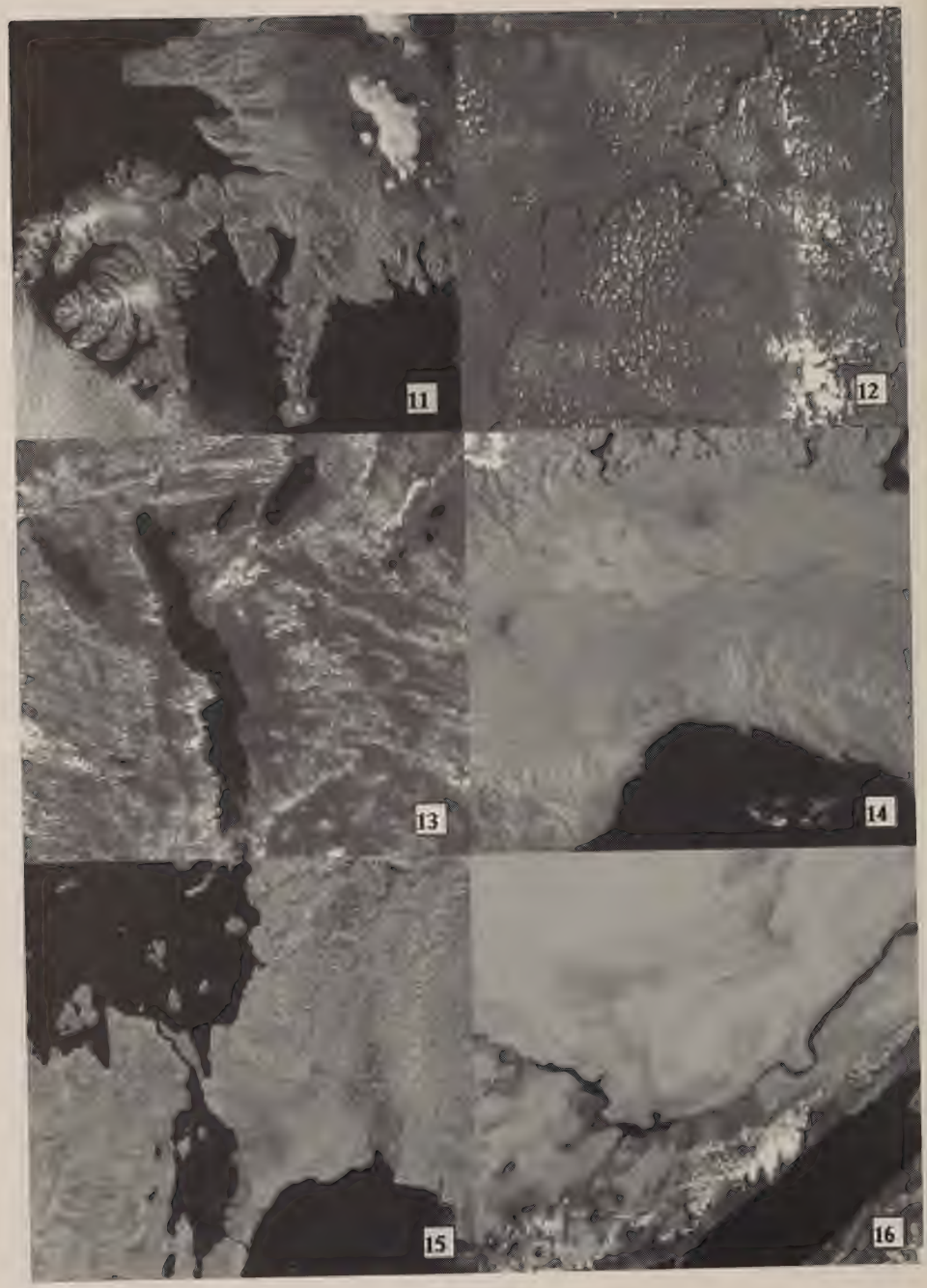
To help while away your spare time on these cold, winter evenings when the only satellites flying over seem to be duff ones, I've assembled an array of images from my archive. Can you recognise the scenes in these images? Unfortunately, in the processing I think some of them may have got rotated although I don't think any flipped over.

All images were received in southern England either from polar-orbiting satellites or from the Meteosat over the Gulf of Guinea. PW.

Answers appear on page 89.




5
6
7
8
9
10


11
12
13
14
15
16

THE SOVIET & CHINESE SCENE

Peter Wakelin

The southbound passes of METEOR 3-5 have continued to give good imagery through the autumn but its orbit will precess to reach the morning terminator during November and it will almost certainly be switched off.

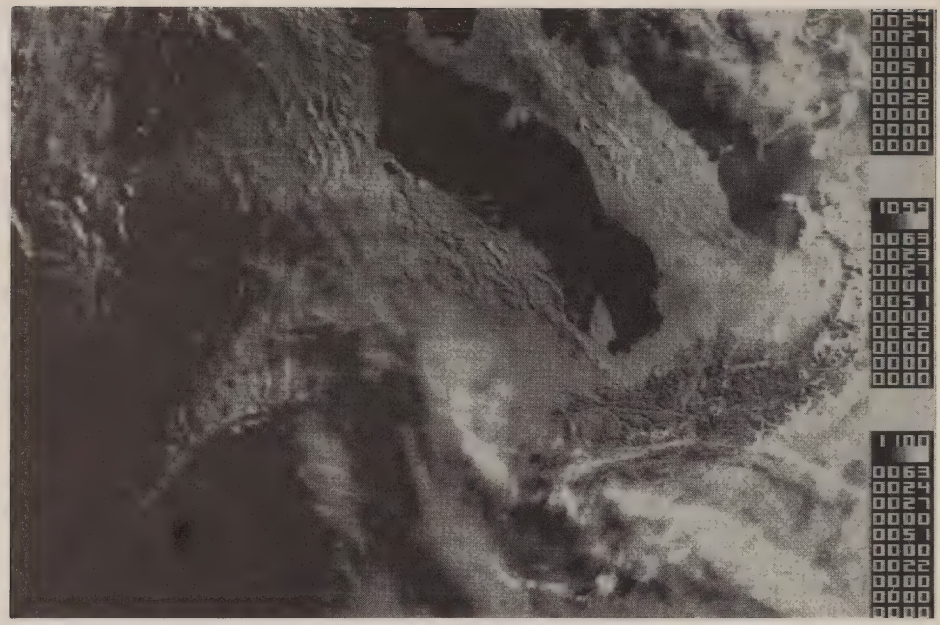
OKEAN 4 was launched at 1430UT on 11 October from Plesetsk in northern Russia. Although some sources identify this object as OKEAN 1-7, I will continue to use the numbering system followed in the RAE Tables as the early Okean-type spacecraft were assigned Cosmos numbers. The launch announcement from Interfax News Agency stated its purposes to be ice reconnaisance in polar areas and the monitoring of storms and typhoons in the world's oceans and added that it has hardware to measure the age and thickness of icefields. Interfax also reported that it was designed by Yuzhnoye Design Board and manufactured in the Ukraine, as was its Tsiklon launch rocket.

I monitored 137.4 MHz on the 12th but was not surprised to hear nothing as OKEAN-3 did not transmit images until two days after its launch on 4 June 1991. Several RIG and Kettering Group members reported signals on the 1518UT pass on the 13th. Considering the very low sun angle the image was of very good quality. Okean's visible images are in the 0.5-0.6 micrometre band. The clock on the image was showing the correct time. Rather surprisingly, it also transmitted images on the following two passes, the latter being well out over the Atlantic Ocean. Normally, in the UK we only receive images on passes low in the east.

On the 1409 pass on the 14th, at only 3 degrees elevation, I could just make out the "Piano Keys" but could not see any detail in the radar image. The images from the 3.2cm side-looking radar (the left side) have a swath width of 450km. Images from the scanning microwave radiometer (IRM-08), which operates at a wavelength of 8mm, have also been seen. At the time of writing this, two weeks after launch, it has adopted the usual catch-me-if-you-can attitude whereby it transmits only infrequently (at least, on passes above my horizon) and usually on the orbits I am not monitoring! RIG 36 contained an article by John Murray on the Okean spacecraft and also some pictures of a very similar spacecraft, Cosmos 1500.

The predictions at the centre of this issue include times of Okean's passes. The times given are for the pass well to the east of the UK where the imagers are most likely to be on.

It was in 1975 that the Russians agreed to provide one of the 5 geostationary weather



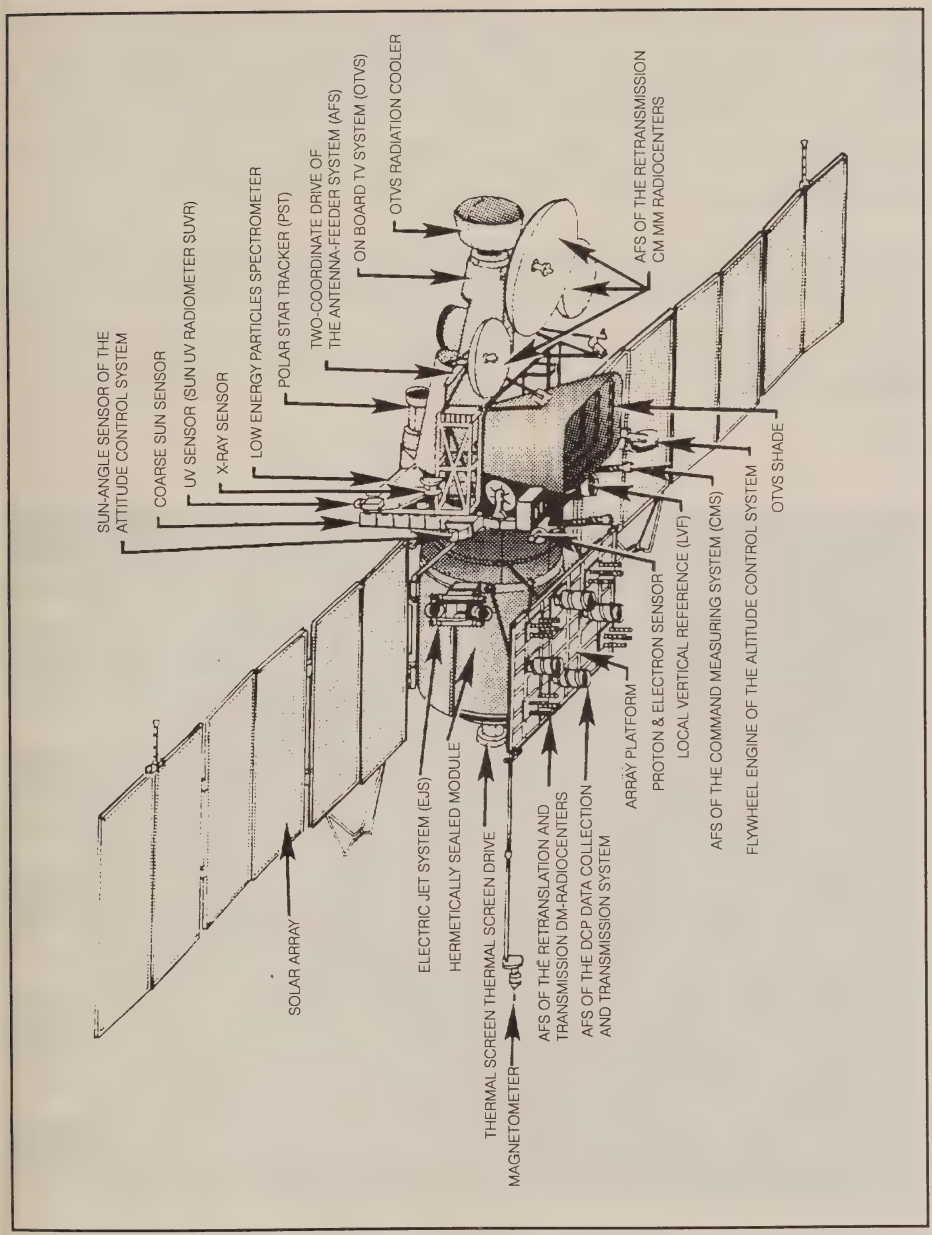
The first image from Okean 4 received by Peter Wakelin at 1518UT on 13 October.

satellites required to support the operational World Weather Watch programme. At that time it was stated that the purpose of the Soviet Geostationary Operational Meteorological Satellite (GOMS) to be:

1. To obtain data on the distribution of clouds at equatorial and middle latitudes on the light and dark sides of the Earth;
2. To obtain data on wind speed and direction at two or three levels;
3. To collect data from observing platforms (including international platforms); and
4. To disseminate cloud pictures, actual and forecast weather charts on a regional and international basis.

It was also stated that it was planned to launch a satellite in 1 or 2 years' time. In November 1979 the Soviets said that the launch would take place in December. It didn't and little more in the way of hard facts was heard of the programme during the 1980s. The programme was resurrected under the new name Electro and then came reports of cash problems and, although the spacecraft was reportedly built, it was in store pending launch.

On 3 October 1994 an ITAR-TASS news agency report by Veronika Romamenkova,


SUN-ANGLE SENSOR OF THE ATTITUDE CONTROL SYSTEM
COARSE SUN SENSOR
UV SENSOR (SUN UV RADIOMETER SUVR)
X-RAY SENSOR
LOW ENERGY PARTICLES SPECTROMETER
POLAR STAR TRACKER (PST)
TWO-COORDINATE DRIVE OF THE ANTENNA-FEEDER SYSTEM (AFS)
ON BOARD TV SYSTEM (OTVS)
OTVS RADIATION COOLER
AFS OF THE RETRANSMISSION CM MM RADIOCENTERS
SOLAR ARRAY
ELECTRIC JET SYSTEM (EJS)
HERMETICALLY SEALED MODULE
THERMAL SCREEN THERMAL SCREEN DRIVE
MAGNETOMETER
AFS OF THE RETRANSLATION AND TRANSMISSION DM-RADIOCENTERS
AFS OF THE DCP DATA COLLECTION AND TRANSMISSION SYSTEM
ARRAY PLATFORM
PROTON & ELECTRON SENSOR
LOCAL VERTICAL REFERENCE (LVF)
AFS OF THE COMMAND MEASURING SYSTEM (CMS)
FLYWHEEL ENGINE OF THE ALTITUDE CONTROL SYSTEM
OTVS SHADE

Drawing of GOMS/Electro. Courtesy of Jet Propulsion Laboratory and Nicholas L. Johnson, Kaman Sciences Corporation.

and faxed to me by Geoff Perry, stated that the launch would take place from the Baykonur cosmodrome on 26 October using a Proton booster to place the craft above the equator at 76 degrees east. She added that the satellite weighs 2,400kg, is more than 6 metres high with a diameter of 1.4m and its two solar panels will unfurl to a total span of 12 metres. The report concluded by confirming that the development time had been dragged out by lack of funds and also by computer software problems.

The launch did not take place on 26th and an Aerospace Daily report, faxed by Marcia Smith, said launch had slipped to the 30th but gave no reason. Launch eventually took place on 31 October and at 0600 on 1 November Electro was at 90 degrees east and drifting towards its operational longitude of 76E at about one degree a day. ⊕

Radar and microwave image from John Boyer clearly showing German cities 1407UT 25 October.

KEPLER ELEMENTS

NOAA 9
1 15427U 84123A 94303.85429861 .00000066 95
2 15427 99.0318 355.8173 0014527 193.9559 166.1215 14.13654782509426
NOAA 10
1 16969U 86073A 94303.89310286 .00000038 9103
2 16969 98.5078 308.7604 0012677 297.5893 62.3990 14.24911764421829
NOAA 12
1 21263U 91032A 94303.95323686 .00000129 2469
2 21263 98.6055 328.6708 0012212 200.3045 159.7651 14.22460937179802
METEOR 2-21
1 22782U 93055A 94301.99175357 .00000023 3540
2 22782 82.5466 100.4128 0021301 209.0300 150.9671 13.83016727 58584
METEOR 3-3
1 20305U 89086A 94303.15127591 .00000044 1827
2 20305 82.5448 176.6687 0007310 333.2682 26.8035 13.04420257240493
METEOR 3-4
1 21232U 91030A 94300.86803034 .00000050 7538
2 21232 82.5394 75.7939 0012230 210.8714 149.1693 13.16464587168816
METEOR 3-5
1 21655U 91056A 94301.24981463 .00000051 7510
2 21655 82.5559 22.7647 0012230 221.4174 138.6027 13.16834513153979
METEOR 3-6
1 22969U 94003A 94301.13728112 .00000051 1189
2 22969 82.5590 322.4563 0013902 296.7400 63.2289 13.16724978 36341
OKEAN 4
1 23317U 94066A 94301.56641020 .00000238 144
2 23317 82.5432 248.7146 0024499 222.5031 137.4230 14.73852508 2507

Frequencies: NOAAs 9/11 137.62MHz, NOAAs 10/12 137.50MHz
METEORs 137.30, 137.40 or 137.85MHz
OKEAN 4 137.40 MHz

Explanation of elements format above:

Line 1: NORAD catalogue number, Epoch, Decay rate (NDOT/2), Bulletin number (thousands omitted), Checksum (1 digit).
Line 2: NORAD catalogue number, Inclination, Right Ascension, Eccentricity (decimal point omitted), Argument of perigee, Mean Anomaly, Mean motion (8 decimal places), Rev. number, Checksum (1 digit). ⊕

MEMBERS' LETTERS

Dear Editor,

RIG members might be interested to know that there is a very good interchange of information available on the 2-metre packet system. At the time of writing the following items are available: A review of the new JVFAX7 software and the JVF1 interface by Doug, G4ZER; Meteosat 5 schedule changes and the latest hurricane scene from Angus, GM4ZER; WXSAT News from G4ZER; RIG weather satellite Bulletin from G3CQL and 2-line Kepler elements for the active weather satellites from G4DQW. Other packet bulletins range from questions on how to build crossed-dipoles to where can one obtain equipment? (a plug for RIG can be a good answer). As the bulletins are usually cancelled after four weeks the news is always changing. To find out what there is to read sign in to your local packet station then at the prompt enter "L>WXSAT". Your input will also be welcome.

Best 73 de John, G3OIC. John Croxford, 16 Chesterwood, Hollywood, Birmingham, B47 5EN.

Dear Peter,

Some members who use Timestep's PROsat II suite of programs probably decided not to purchase the optional TRACK II as their existing prediction program was adequate. It might have occurred to them, however, that it would be useful to be able to load and run their program from within PROsat II by using the redundant TRACK II button in the main menu screen, thereby eliminating a lot of key presses or mouse clicks.
Here is how to do it: (but first, make a backup copy before changing anything.)

Using an ASCII editing utility (DOS Edit, XTPRO, RPED are a few examples) open the file MENU.BAT in your C:\ (root) directory. Cursor down to the line commencing "if exist..." and alter this to: if exist \xxxx\track.inf goto trackok (where xxxx is the name of the directory containing your tracking program).

Cursor down to the line after ":trackok" and change this to: cd\xxxx (the name of your tracking program directory as before).

Alter the next line to the command which runs your tracking program.

Using any editor or word processor, open and save a file with the title "track.inf". Copy this empty file into your tracking program directory.

Load PROsat and click on the TRACK II button. Your prediction program should now appear. Quitting should return you to the PROsat II main menu screen. This works for me with InstantTrack and PCTrack - I have not tried it with programs which are called with a BAT file.

Next, if you wish, you can change the wording of the TRACK II button. This requires the use of an editor which works in Hex, as mentioned in my namesake's letter on page 55 of Journal 38. I suggest that the name be changed to TRACKING as this occupies the same space and is a suitably universal name. I did the job successfully with Norton DiskEdit.

The file to be edited is XMENU.EXE in VGASAT4. For safety copy it to a floppy and use that for the editing exercise. Only 3 characters have to be changed:

change byte 23194 from 20 (space) to 49 (letter I)
change byte 23195 from 49 (letter I) to 4E (letter N)
change byte 23196 from 49 (letter I) to 47 (letter G)

These bytes are near the end of the fairly long file so it is quicker to use the END key and then Page Up to the relevant lines.

Save the changes. At the DOS prompt or in your usual file manager rename the existing XMENU.EXE file in VGASAT4 to OLDXMENU.EXE and then copy the diskette file into VGASAT4.

A. Nother Hacker. (Full name and address was supplied. Ed)

Dear Peter,

I was most interested in the images from Clementine, especially the one of East Africa covering southern Mozambique to southern Tanzania (RIG 38 page 28). If only we had images like these available to the Rhodesia (now Zimbabwe) Meteorological Service during my time there from 1952 until 1966.

In this image there is a clearly marked tropical cyclone in the central part of the Mozambique Channel, in the vicinity of the Zambesi delta. Typically, these tropical cyclones develop to the east or northeast of Madagascar during the southern summer (December, January and February) and move westwards initially, then south or southwest, favouring a sea track either side of Madagascar and frequently,

as in this case, down the Mozambique Channel.

One effect of these cyclones is to induce comparatively dry, southerly air across Zimbabwe and southern Malawi, effectively pushing the Intertropical Convergence Zone northwards. In this image it lies between Lakes Malawi and Tanganyika. Remember that winds blow clockwise around low-pressure systems in the southern hemisphere. A succession of such events can bring serious drought conditions and the image shows a lack of any organised cloud over Zimbabwe and S Malawi.

Regards, Peter de la Mothe, 35 Brookside, Wokingham, Berks, RG11 2ST.

Dear Peter,

I would like to point out that part of Tom Woolner's article (RIG 38, p43) should be clarified, otherwise members could end up with a potentially dangerous situation. He mentioned that he has grounded the case on his computer to a brass stake in the garden.

This is fine UNLESS yours is a modern house with Protective Multiple Earthing (PME). Houses with PME do not have a separate mains earth for each house but are earthed at the nearest distribution point. Only the live and neutral are distributed to each house, the neutral having been connected to earth at the distribution point. The use of Earth Leakage breakers when using external appliances or running supplies to out-buildings is mandatory. This is because, in the event of a break in the neutral line, all the metalwork in the whole house will rise to live mains potential which is safe because there is no separate earth. However, if members put an earth stake in their garden and connect their computer case to it the situation becomes dangerous. In the event of a neutral fault then all of your, and your neighbours', appliances that are in use will take their earth return via your computer case and earth stake. The results could be catastrophic. I would therefore urge members to check whether their house has PME or not before connecting an earth stake. If they are unsure, then they should seek advice. The electricity companies have very strict guidelines on such activities. The RSGB also have an advice page on this in the UK Callbook.

All the best, Graham Biggs I.Eng MIEIE, 16 Maple Drive, Newport, IoW PO30 5QP.

Dear Peter,

I have seen the hobby of receiving and displaying Earth weather satellite images

expand its numbers phenomenally and improve the quality of the printed image fantastically.

Early RIG Journals (1985/86) gave over many pages to the enigmatic YU3UMV frame store (a computer-less system to display weather satellite video images) and to the BBC micro-computer which, by today's standards, produced what must be regarded as pretty awful pictures. The early pioneers who still have great currency, Timestep, Dartcom and others, have given to the hobbyist images whose quality is nothing short of professional. This being the case where do we go from here to keep up the pioneering spirit?

Well, there are other spacecraft which scan the surfaces of other planets. It would be quite an achievement for a hobbyist to receive images from the Hubble Space Telescope as it looked at Jupiter. Many Solar System probes transmit information about planets' surface. Signals from these probes are very weak and are coded but not encrypted. The codes are designed to make the most of the large available bandwidth and to make provision for a very low received signal-to-noise ratio. Some terrestrial line codes which are optimised for the opposite criteria, ie narrow bandwidth and relatively high signal-to-noise ratio, are high density binary 3 (HDB3) and any of the nBmB codes.

Not an easy task by any means but then neither was the reception of APT in the 1970s.

Yours sincerely, Chris Meadows, 14 Conway Crescent, Bedford, MK41 7BW.

Dear Peter,

The splendid images of Jupiter in RIG 38 reminded me of last July when I was in China. Every night after work I watched the Chinese TV news hoping for some images of the Shoemaker-Levy 9 comet collisions with Jupiter. Interest in China was quite high and the China Daily News published times for the collisions under the Science/Entertainment section! The Chinese are well aware of the damage that such events can cause. The most recently documented series of fireballs from the skies to hit China was in 1629, when more than 20,000 people were killed in Beijing (Peking).

For the Shoemaker-Levy 9 event, the Beijing Observatory put on a special show at their Planetarium and, although it was all in Chinese, it was well worth the visit. I learned that the Chinese for Jupiter is Mu Xing, which means Wood Star, and saw a few nice Landsat images of China.

When I arrived back at the hotel from the Planetarium I put on the TV and there was a Long March-3 rocket on a launch pad. A quick phone call to a Chinese friend confirmed that I was looking at a live launch from Xichang and that there were about five minutes to lift-off at 1831 local time (1031 GMT 21 July 1994).

It was fascinating to compare the Chinese TV coverage of the launch with American TV coverage of a US launch. The first thing that I noticed which quite worried me was that the launch pad was in a valley full of trees and greenery. Surely the whole place would catch fire on ignition?

The countdown seemed a very quiet affair with a voice in the background saying OK every now and again. The TV showed several westerners in the viewing gallery. I later found out that the rocket was launching a satellite made by Hughes Communication International Inc. of the USA.

The most amazing difference between a Chinese and an American launch was at the moment of ignition. All the smoke and heat appeared to be ducted away underground, and the trees and greenery that I was worried about were preserved.

After lift-off the rocket tracked north east over China dropping the first stage into the mountains in Guizhou Province (apparently they inform people to keep out of a certain area). After 123 seconds there was a loud bang and a lot of worried faces; then relief, because in the excitement someone had kicked over an empty crate they were using as a foot rest. It continued north east and, if it hadn't been for tropical cyclone Yunya hitting Beijing that evening, I might have seen it crossing the sky. The second stage dropped into the Pacific and after twenty minutes the third stage put Aptstar-1 into orbit at 43,000km. The satellite has twenty four C-Band transponders and is expected to last ten years. It will be used to improve the telephone and TV systems in China and SE Asia from a position over the equator at 131 degrees east.

The Chinese plan about six launches a year until the end of the century. Let us hope that one of them is a replacement for the Feng Yun-2 weather satellite which was destroyed in April.

Kind regards, Keith Holland G3MCD, 40 Brooklands Rise, London NW11 6DS.

Dear Peter,

The article in RIG 38 on the new Martelec Interface for JVFAX mentioned that some people had comb-effect problems on the histogram display. I use a 486 DX2-66 and had the same problem when running at 66MHz. When I switched the

speed to 20MHz the comb-effect disapeared. I mentioned this to Eberhard Backeshoff when I sent him a donation for the JVFAX software and he sent me the following explanation:

"The spikes problem might indeed be caused by the fact that your computer is too fast. To switch the multiplexer in the interface JVFAX generates a switching signal on the RTS line. After having toggled this line, JVFAX waits a short time before reading the data from the interface to give it time to set the correct data. This delay time depends on the computer's speed and perhaps the delay is just too short to give the Martelec interface enough time to set the data when running at 66MHz."

He suggests trying the MMI setting instead of the 'serial port' as, in this setting, the JVFAX software uses fixed-delay timings. However, he warns that it will not decode SSTV transmissions correctly in this mode.

Kind regards, Keith Holland G3MCD, 40 Brooklands Rise, London, NW11 6DS. ⊕

BULLETIN BOARDS

Orbital elements and other information of use to members are available from several electronic bulletin boards. The three listed below all offer free service and are available 24 hours a day. In addition to orbital elements (in both Amsat and NASA 2-line formats), the RIG and Timestep services include regularly updated weather satellite status reports indicating which ones are transmitting and their frequencies. The RIG board also offers a range of shareware programmes.

Telephone numbers:	RIG BBS	01945 85666 (440666 from mid January)
	Timestep BBS	01440 820002
	Dartcom BBS	01822 88249

In each case the protocol is the normal 8 bit, no parity, 1 stop bit. ⊕

FOR SALE, MUST CLEAR. Dartcom 1m dish and feed horn with ground stand. As new. £130. Meteosat down-converter w/proof box excellent (indoor use only) £130. Marconi 'Trackelball' unit for PC (bus card). New £29. Junghans MSF/Rugby 'atomic' clock £30. Viglen 286 PC, 1MB, h/disk and maths co-pro, less monitor. £140. NEC multisync 5FG 17 inch monitor. Mint, boxed. £580. Carriage all items at cost. Sensible offers for 2+ items. Phone Paul G4XHF (Crawley) on 01293 515201.

SHAREWARE CORNER

Les Hamilton

The eagerly awaited upgrade, JVFAX v 7.0, became available just too late to be offered in RIG 38. My thanks to several members who forwarded copies. During the past quarter, I sent disk C-02 to most of you who requested disk C-01. Disk C-02 contains not only JVFAX70, but also the files HamComm, PKTMon and RTTY_FAX referred to in Mark Pepper's article in the September issue. It looks likely that this disk will replace C-01.

Since quite a number of programs in the Shareware Library have all but outlived their usefulness, I intend to delete some, slimming down the Library to more manageable proportions. Hopefully, a fully revised listing will appear in RIG 40 in March.

JVFAX v 7.0

This program is now available. Much has been written on JVFAX in recent issues of RIG, and it requires no further comment here. [Disk C-02]

HAMCOMM v 3.0

This recent version of the program supports reception and transmission of radio teletype (RTTY), AMTOR ARQ/FEC, SITOR A/B, NAVTEX and Morse code (CW) signals. A decoder for SHIP and SYNOP reports from weather stations is also included. The receiver is connected to your PC's serial port by means of a simple, low-cost interface (interface schematics are included in the on-line help texts), and audio frequency decoding and serial/parallel conversion are all done in software. There are pre-defined standard phrases, a QTH distance/direction calculator and a callsign decoder. About 370kB of free RAM is required. [Disk C-02].

IPHOTO

IPHOTO is a rather clever image viewing and enhancing program. Operating exclusively on TIF image files, IPHOTO allows you to preview any image adjustments before implementing them. For example, you can drag sliders to alter the colour histogram of your image (red, blue and green individually) and see the changes taking place as you do so. But these only become permanent on clicking the 'OK' button. Click 'cancel', and you're back to the original. Alterations to brightness, gamma and hue work similarly - much more convenient than having to

reload your original if you have made alterations that you don't like. IPHOTO also allows conversion between 256-colour, RGB full colour and grey scale images. It also supports cropping, image rotation and filtering. Unfortunately, there is neither a help file nor a help menu but operation is, in the main, simple and intuitive. Sometimes, after converting your image to the TIFF format, IPHOTO refuses to load it but I have found an easy fix for this. Simply load the TIFF file into Paintshop Pro, then re-save it. The re-saved version loads fine. [Disk I-04]

IMAGE COMMANDER v 1.0

This is a Windows program for image management and manipulation, featuring the facility to organising images into albums which can be printed. Images can be arranged using drag and drop methods, or a sort option. Images may be catalogued using keywords and comments for future searches. It is also possible to view images in a slide show format. Image Commander supports 21 different file formats and can be used for making conversions between GIF, TIF, PCX, BMP etc. There is support for Move, Copy, and Rename file operations, as well as for removable disks and CD-ROMs. [Disk I-04]

MAKE-PCB

Jan Jager of the Netherlands sent in this program which is a drawing program dedicated to the production of single-sided printed circuits. Completed designs can be printed out using the supplied utilities PcbEpson and PcbLaser. PcbLaser also outputs copy to DeskJet printers. There are over 30 sample PCB drawings on the disk to illustrate what can be achieved. I have translated the Help file (which was in Dutch) as ENGLISH.DOC, and found the program works extremely well. The only shortcoming that I can see is that some of the functions do not operate correctly with the mouse, though everything can be achieved by means of keyboard alternatives. Only available on Disk RIG-39 at present.

VUEPRINT v 2.2

This is a Windows viewer for GIF, BMP and JPEG images, and can also interchange your files between these three formats. As the name implies, it allows the dumping of images to your printer. VuePrint is pretty fast, and includes a neat slideshow option. All you have to do is select the time delay between images from a drop down menu, and all the images in the logged-on directory are displayed in sequence. Foolproof and as simple in operation as you can get. Additionally, the program boasts a good range of image processing features, making it a really good an all-round package. [Disk I-04]

UPGRADE NEWS

There have been minor upgrades to WST v 4.5d [T-02] and TRAKSAT v 3.03a [T-01]. SCREEN THIEF is now in version 1.56 [U-01]. Geoclock [T-02] is now upgraded to version 5.3, with improved mouse support.

Once again, the reviewed shareware is offered till the end of February, as the RIG-39 compilation disk.

DECEMBER ADDITIONS TO THE RIG PC SHAREWARE CATALOGUE

Disk C-02 JVFAX v 7.0
*HAMCOMM v 3.0
PKTMN
RTTY_FAX.ZIP

Disk I-04 *IMAGE COMMANDER
*IPHOTO
*VUEPRINT

Disk RIG-39 MAKE-PCB plus all the above except JVFAX.

Applications requiring Microsoft Windows are indicated by an asterix (*).

HOW TO OBTAIN COPIES OF THE RIG SHAREWARE LIBRARY DISKS

Send up to a maximum of 6 formatted, 1.44 Mb, MS-DOS 3.5" disks per request, to Les Hamilton, 8 Deeside Place, Aberdeen AB1 7PW, Scotland.

Disks must be sent in a sturdy, resealable package such as a padded jiffy bag (or a package within a package), and *each separate request* must be accompanied by:-

i) a self-addressed adhesive label
ii) stamps for the return postage
iii) coins (or additional postage stamps) to the value of £2.

Note that overseas members' return postage is free, but we would appreciate an exchange of shareware or satellite images in lieu.

Please send any new and updated versions of useful shareware to me at the above address. If you have any problems running any of the shareware from the RIG Library, please enquire by letter, and I'll do my best to reply by return.

RIG GIF LIBRARY

Peter Wakelin

About fifty members have requested disks in the last 3 months and almost all wanted the Jupiter images. I have made up two more disks this time which I hope will be equally popular.

Disk 134 is the Rabaul Caldera disk. It contains a sequence of GMS images showing the development of the ash plume and also a higher resolution NOAA image. A couple of large scale maps of the area are included as is the stereogram which is reproduced elsewhere in this issue. Pictorial representation of sulphur dioxide emissions as determined by TOMS on Meteor 3-5 is also included. There is also a long text file of unedited reports from various sources reporting on the eruption as it developed.

JVFAX seems to be very popular and deservedly so if Mike Goodall's images are typical of what members are getting out of it. Usually, I don't give coloured images a second glance but these are different to anything I have seen before. I still havn't a clue as to what the colours mean but they are very sharp and nice to look at. One of Mike's images appears on the inside front cover and I will select 4 or 5 for disk 135.

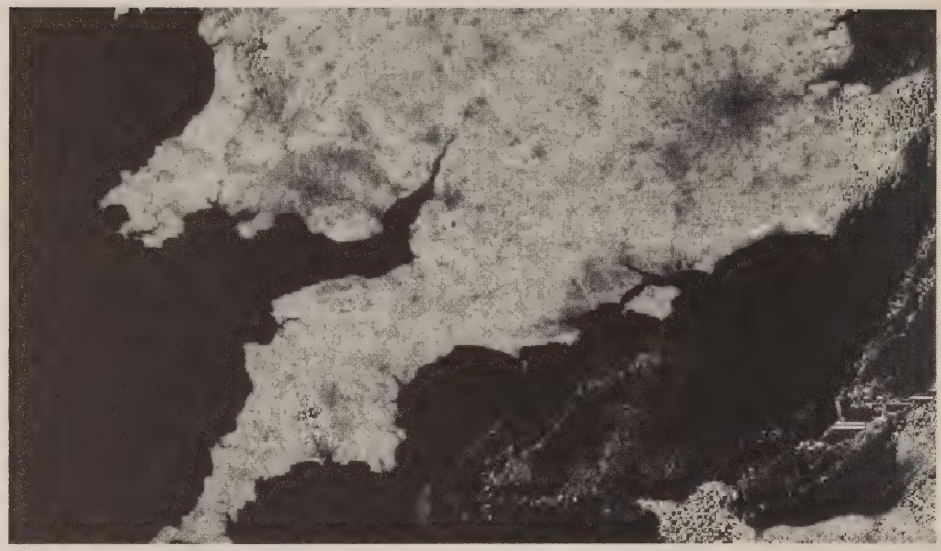
Disks currently available are those listed in RIG 36 plus the following:

128	British Isles, HRPT (5 images)	Peter Wakelin
129	Africa, PDUS, Meteosat 5 (5)	Peter Wakelin
130	NOAA 13 images (5)	
131	Africa/MidEast, NOAA, Meteor (5)	
132	High res GMS-4 at 140 deg E (1)	
133	Comet/Jupiter collision (13)	STScI
134	Rabaul Caldera eruption (18)	
135	JVFAX images Meteosat (4?)	Mike Goodall

HERE'S HOW TO OBTAIN YOUR DISKS

The cost is £2 for the first disk plus one pound for each additional disk with no limit to the number ordered. RIG provides disks, packaging and postage. For small orders, UK members may prefer to send postage stamps rather than write cheques for small amounts.

UK members: Cheque or postal order made payable to Remote Imaging Group



Part of one of the images on Disk 128

and sent to Peter Wakelin, 1 Charters Road, ASCOT, Berkshire, SL5 9QF. There is no credit card service for members in the UK.

Other members: Bank draft (in Sterling and drawn on a London-based bank) or Eurocheque made payable to Remote Imaging Group and sent to Peter Wakelin at the address above. Overseas members may prefer to pay by credit card in which case orders (which will be subject to a 3% surcharge) should be sent BY MAIL to Mark Clarke, 9 Park Lane, Bulmer Tye, SUDBURY, Suffolk, CO10 7EQ, UK. ⊕

PRODUCT NEWS

MARTELEC's JVFAX interface unit now incorporates the fixes mentioned by Peter Dobson in RIG 38. This updated version is now available through RIG together with connecting leads and the JVFAX version 7 software. See RIG Shop Corner for prices.

TWO CD-ROMs are now available from RIG. Although they have been available for some time from Holland and Germany, RIG has purchased a quantity to facilitate purchase by members.

ERS-1 CD ROM, published by the European Space Agency, comes nicely packaged with a very comprehensive 27-page manual detailing installation and disk contents.

System requirements: The CD can be used on an Apple Macintosh, IBM PC or compatible, or a SUN workstation. IBM PC requirements follow, as the majority of members have these machines, but upon receipt of a self addressed, stamped envelope, Mark Clarke (address on page two) will send details of requirements for Apple and Sun machines.

IBM PC (or compatible) requirements:

80386 or 80486 processor (all models)
4 MB RAM (6 MB of free virtual memory required)
Windows 3.1 or 3.0 with Multimedia Extensions
Graphics Card, 8 bit 256 colours (SVGA) although 16 colours may be used. 640x480 resolution.
Hard disk space: Minimum of 5.3 MB

The CD-ROM is divided into 3 levels:

Level 1 - Highlights - Brief summary of ERS-1's contribution to studies of Earth's complex systems.
Level 2 - Overview - Permits browsing through a wide range of topics illustrated with diagrams, photographs, satellite images and animations.
Level 3 - Manual Detailed information about the ground facilities and data services.

METEOSAT CD-ROM - 6 years of observations of Earth and its environment. This CD contains a catalogue of 2200 images taken between 1986 and 1991

System requirements:

IBM PC or compatibles
AT/80286/80386/80486 all models.
Graphics card, 8 bit,256 colours (SVGA) although card with 16 colours may be used. 640x480 resolution.
VPIC, or similar, graphics viewer.

Details of prices and how to obtain these CD-ROMs are shown in RIG Shop Corner. ⊕

QUESTIONS AND ANSWERS

Q. I plan to use the HF Fax and RTTY weather broadcasts from Bracknell to help me understand the weather satellite images better. As the Met Office now seem

reluctant to give away free information are these services secure for the forseeable future?

A. Several members have enquired about the future of these broadcasts recently. These services have remained virtually unchanged for several decades now and use old and very slow techniques by today's standards. These services originated to meet military requirements and until the advent of satellite communications were the only way to get timely data to and from the UK's overseas Met Offices (the Met Office is within the Ministry of Defence) and Royal Navy ships. With the ending of the Cold War and further defence cuts inevitable the future of these services is very uncertain. A Met Office spokesman confirmed that they will end when the Royal Navy has no further requirement for them.

Q. I can now decode the upper-air data in the RTTY meteorological broadcasts and am trying to use them to deduce cloud structure. How accurate are these reports?

A. The data you require are in the messages headed TTBB which contain sufficient data points from the ascending radiosonde to indicate temperatures to within one degree (C) and 10% relative humidity. These are the normal criteria up to about 10km altitude. It should be stressed that it is quite impossible to deduce any meaningful cloud structure using only the limited fixed-level data reported in TTAA. Another essential requirement for the correct interpretation of the data is that they be plotted on a temperature / log pressure chart. If the dew-point is less than about 3 degrees colder than the temperature then the radiosonde almost certainly was in cloud whereas dew-point depressions greater than about 10 degrees indicate cloud-free air. To determine whether the cloud is layered or convective in nature would require several pages of explanation. Robin McIlveen's book, The Fundamentals of Weather and Climate, mentioned elsewhere in this issue is recommended reading.

Q. I live in Taunton and early on 21 September I received a clear image from NOAA 9 showing Russia and Turkey. I was surprised to get images from that far east as I use a crossed dipole (with Timestep's equipment) and am surrounded by buildings. Is this unusual?

A. The satellite came above Taunton's horizon when it was south of Archangel, passed over Moscow, just east of Odessa and was east of Crete when it went over the horizon. The maximum elevation was only 5 degrees above the horizon which goes to show that simple equipment can achieve good results. Atmospheric conditions probably played a part in this unusually good reception. ⊕

RIG HELPLINES

General enquiries Meteosat information, NOAA information, Supplier complaints		John Tellick	0181 390 3315
A copy of the Group's rules can also be obtained from John Tellick			
Russian and Chinese satellite information		Peter Wakelin	01344 23200
HRPT		Peter Wakelin	01344 23200
PDUS		James Brown	01656 782632 *(not available on Sundays)*
Schools/educational co-ordinator		John Tellick	0181 390 3315
Schools/educational enquiries	John Murray	Torquay	01803 217754
	Frank Bell	Godalming	01483 416897
	Tom Walter	Reading	01734 871330
	Bob Coombes	Haslemere	01428 642930
	John Din	Bristol	01454 773387
	Alan Wright	Norwich	01603 713449
Framestore technical support		Mike Coombes	01530 243494 *(7.30pm-9.30pm)*

Microcomputer specialists:

PC and printer problems	Mark Pepper	01344 777730 *(7.30pm-9pm)*
Commodore Amiga	Chris Pretty	01420 82752
Archimedes	Tom Walter	01734 871330

NOTE: We are grateful to the above members for offering their services to the Helpline. Please do not abuse the service by ringing them for queries other than those listed against their names.

All the helpline numbers listed under Schools/educational enquiries are situated in the south of England. John Tellick (address on page 2) would be pleased to hear from members in the educational field in other areas who would be willing to give help and advice. ⊕

REMOTE IMAGING GROUP

RIG SUBSCRIPTION - NEW MEMBER

If you would like to become a member and receive the Journal, photocopy this page, complete the form below, sign the declaration and send it to...

RIG SUB, PO BOX 142, Rickmansworth, Herts, WD3 4RQ, ENGLAND

The subscription rates for 1995 are...

UK membership	£10.00	Europe outside EC	£12.00
Europe EC	£12.00	Outside Europe	£14.00

Name _____ Call Sign (if any)_____

Address. _____

_____

_____Post Code_____

Country _____ Telephone No._____

Are you receiving:
Polar-orbiting Weather Satellites _____ Geostationary Weather Satellites _____

Do you require back issues? (see Rig Shop Corner) _____

Amount Enclosed £_____

Payment by Visa/MasterCard/Eurocard - there is no surcharge:

Card No._____ Expiry date_____

Signed _____ Date _____

Are you willing to have your name/address made known to members in your area? YES / NO. *(Delete as applicable)*

DECLARATION: I do NOT object to the Remote Imaging Group holding my Membership details on a computer.

Signed _____ Date _____

RIG SHOP CORNER

ALL PRODUCTS ARE FOR SALE TO RIG MEMBERS ONLY, FOR THEIR OWN PERSONAL USE AND NOT FOR SELLING-ON.

IN THE EVENT OF PROBLEMS WITH EQUIPMENT PURCHASED FROM RIG PLEASE CONTACT RIG IN THE FIRST INSTANCE AND NOT THE MANUFACTURER.

All prices shown include post and packing except where marked

Receiving / Decoding Equipment	UK/EC Price	Overseas Price
RIG DARTCOM Meteosat Downconverter. Assembled and tested module in tin plate box	£155.00	£132.00
Complete, assembled and mounted in weather-proof box.	£190.00	£162.00
RIG DARTCOM VHF Scanning Receiver. Assembled and tested module with LED channel number display.	£135.00	£115.00
As above but with LCD frequency read-out instead of LED channel number display. *Both the above items are modules and require a box, together with several components, switches, etc.*	£179.00	£152.00
RIG VHF Preamp. Includes a bandpass filter and is ideal for mast-head mounting. Assembled/tested module; needs boxing.	£18.00	£16.00
RIG 1695MHz Low Noise Amplifier kit. *Experienced constructors only.*	£29.00	£25.00
Martelec JVFAX Interface Unit Connecting lead £5 extra (specify whether 25 or 9-pin required)	£78.00	£70.00

Antenna systems	UK/EC Price	Overseas Price
RIG CROSSED DIPOLES A Turnstile type design, in kit form	£26.00	*(UK Only)*
RIG/TH2 47-element YCV loop Yagi (1.7GHz)	£85.00	*(UK Only)*
DISHES *1.0 Metre (dish only), nearly new condition*	£25.00+P&P	*(UK Only)*
DISH FEEDS	£25.00+P&P	*(UK Only)*
JAYBEAM 5X-Y 2m 5 element crossed Yagi, in kit form	£55.00	*(UK Only)*

RIG Binders

Available by post from Gordon Fleming, 168 Blythway, Welwyn Garden City, Herts. AL8 1DU. UK Price £4.00 each, EC/European Price £4.50, Outside Europe Price £5.00. Cheques to *"REMOTE IMAGING GROUP"* please.

CD-ROMS	UK Price	EC Price	Other Price
ERS-1	£12.00	£13.00	£14.50
Meteosat	£12.50	£13.50	£15.00

Back Issues of RIG Journals

		Rally Price	UK Price	EC/Europe Price	Outside Europe Price
RIG 8-11	1987	£4.00	£5.00	£6.00	£7.00
RIG 12-15	1988	£4.00	£5.00	£6.00	£7.00
RIG 16-19	1989	£4.00	£5.00	£6.00	£7.00
RIG 20-23	1990	£5.00	£6.00	£7.00	£8.00
RIG 24-27	1991	£5.00	£6.00	£7.00	£8.00
RIG 28-31	1992	£5.00	£6.00	£7.00	£8.00
RIG 32-35	1993	£5.00	£6.00	£7.00	£8.00

Note: Prices quoted are for a set of four, including Post and Packing.

RIG 1-7 are currently out of print. Owing to depletion of some issues, photocopies may be supplied. Individual issues are no longer available (hardship cases excepted).

Ordering Information

All items are available from the Editor, Peter Wakelin and include return by UK 1st class mail (except antennas and Journals). Items to non-UK addresses sent via air-mail.

UK VAT is now applicable on sales to the following EC countries - France, Germany, Belgium, Portugal, Spain, Republic of Ireland, Denmark, Italy, Luxembourg, Netherlands, United Kingdom (including Isle of Man). Members in these countries should use UK/EC price when ordering. EC members who are registered for VAT must forward their VAT registration No. to the Treasurer to enable them to receive VAT exempt goods.

As UK/EC prices now include VAT where applicable; receipts will be issued upon request. Remote Imaging Group VAT Registration No. 594 7483 83. Channel Isles: divide by 1.175 to remove VAT content.

UK members, By Cheque or Postal Order.

Overseas members, Pay by Bank Draft (drawn on a UK London-based bank) or Eurocheque(s). (Payments to a Maximum of £100.00 in any one Eurocheque). No local currency please.

All cheques made payable to ***"REMOTE IMAGING GROUP".***

Credit Cards Accepted (Access/Visa/Mastercard/Eurocard) Add 3% to Total. Available by MAILORDER only from the Treasurer, Mark Clarke, 9 Park Lane, Bulmer Tye, Sudbury, Suffolk, CO10 7EQ.

Please state type of card, Card No., Expiry Date.
All Credit Cards authorised before goods are despatched.
(Note: Ordering by Credit Card does not mean instant despatch!) ⊕

HOW GOOD IS YOUR GEOGRAPHY? - ANSWERS

1. River Danube and Lake Balaton, Hungary. 2. River Congo, Zaire. 3. Paris. 4. Holland. 5. Scoresbysund, Greenland. 6. Senegal and Mauritania. 7. Sicily. 8. Irish Sea. 9. SW France. 10. East Denmark. 11. NW Iceland. 12. River Danube below Belgrade. 13. Lake Tanganyika. 14. River Po, Italy. 15. Dardanelles and Bosporus, Turkey. 16. River Nile, Egypt. ⊕

THE COVER IMAGES

FRONT COVER: This is an image of the Kliuchevskoi volcano, Kamchatka, Russia, which began to erupt on September 30, 1994. Kliuchevskoi is the bright white peak surrounded by red slopes in the lower portion of the image. The image was acquired by the Spaceborne Imaging Radar-C and X-band Synthetic Aperture Radar aboard the space shuttle Endeavour on its 25th orbit on 1 October 1994. The image shows an area approximately 30 kilometers by 60 kilometers that is centred near 56 degrees north latitude and 161 degrees east longitude. North is toward the top of the image. The Kamchatka volcanoes are among the most active in the world. The volcanic zone sits above a tectonic plate boundary, where the Pacific plate is sinking beneath the northeast edge of the Eurasian plate. The Endeavour crew obtained dramatic video and photographic images of this region during the eruption, which will assist scientists in analysing the dynamics of this activity.

The colors in this image were obtained using the following radar channels: red represents the L-band (horizontally transmitted and received); green represents the L-band (horizontally transmitted and vertically received); blue represents the C-band (horizontally transmitted and vertically received). The Kamchatka River runs from left to right across the image. An older, dormant volcanic region appears in green on the north side of the river. The current eruption included massive ejections of gas, vapour and ash, which reached altitudes of 20,000 meters. New lava flows are visible on the flanks of Kliuchevskoi, appearing yellow/green in the image, superimposed on the red surfaces in the lower center. Melting snow triggered mudflows on the north flank of the volcano, which threatened agricultural zones and other settlements in the valley to the north.

Spaceborne Imaging Radar-C and X-band Synthetic Aperture Radar (SIR-C/X-SAR) is part of NASA's Mission to Planet Earth. The radars illuminate Earth with microwaves, allowing detailed observations at any time, regardless of weather or sunlight conditions. SIR-C/X-SAR uses three microwave wavelengths: L-band (24 cm), C-band (6 cm) and X-band (3 cm). The multi-frequency data will be used by the international scientific community to better understand the global environment and how it is changing. The SIR-C/X-SAR data, complemented by aircraft and ground studies, will give scientists clearer insights into those environmental changes which are caused by nature and those changes which are induced by human activity. SIR-C was developed by NASA's Jet Propulsion Laboratory. X-SAR was developed by the Dornier and Alenia Spazio companies for the German space agency, Deutsche Agentur fuer Raumfahrtangelegenheiten (DARA), and the Italian space agency, Agenzia Spaziale Italiana (ASI), with the Deutsche Forschungsanstalt fuer Luft und Raumfahrt e.v.(DLR), the major partner in science, operations and data processing of X-SAR.

Image and text courtesy of Jet Propulsion Laboratory.

INSIDE FRONT COVER (TOP): Ben Ramsden goes to great heights to lower his horizons. See his article Remote Imaging Remotely in this issue.

INSIDE FRONT COVER (BOTTOM): This image was supplied by Mike Goodall and was produced using JVFAX v 7.0 and the Martelec interface unit. See his article in this issue.

INSIDE BACK COVER: This image was one of the first received from the IRS-P2 spacecraft launched on 15 October. The spacecraft was flying over NE India on its 15th orbit and the data were received and processed at the National Remote Sensing Agency's data reception centre at Shadnagar near Hyderabad. This image shows the Brahmatutra River in the Kamrup district of Assam and the surrounding area. The area shown is approximately 50 x 80km and is centred near 26 degrees north, 91 degrees east.

BACK COVER: A Meteosat spacecraft. See The Meteosat System in this issue. Photograph courtesy of EUMETSAT.

THE IMAGES ON THE FOLLOWING PAGES

Page 92. This image from GMS 4 above 140 degrees east is timed at 0230UT on 20 September 1994. Sri Lanka and India lie near the western extremity and the lakes of Tibet are clearly visible.

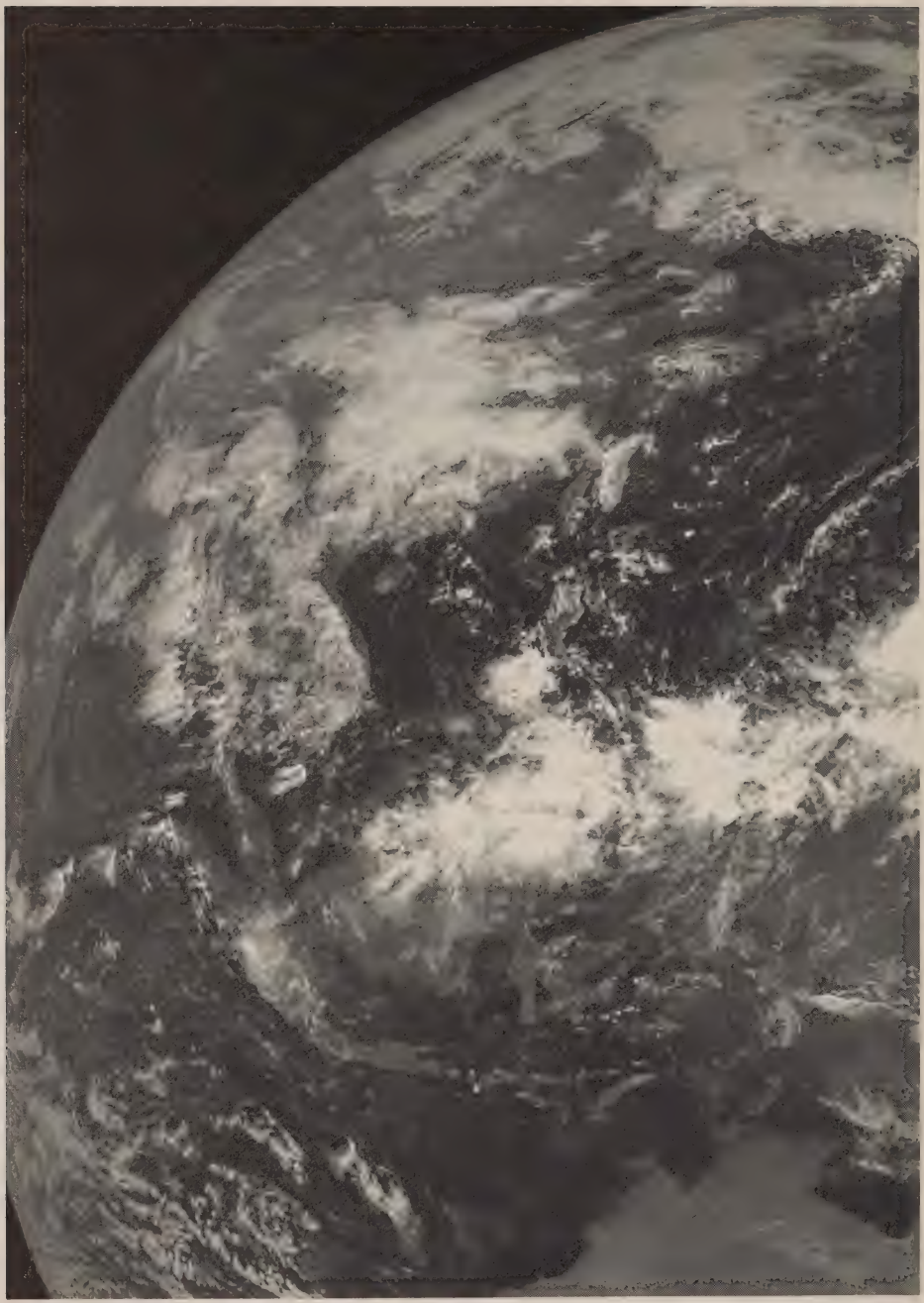
Page 93. These two images were produced by Marciano Righini from NOAA HRPT data and show northern Italy and the Pyrenees Mountains.

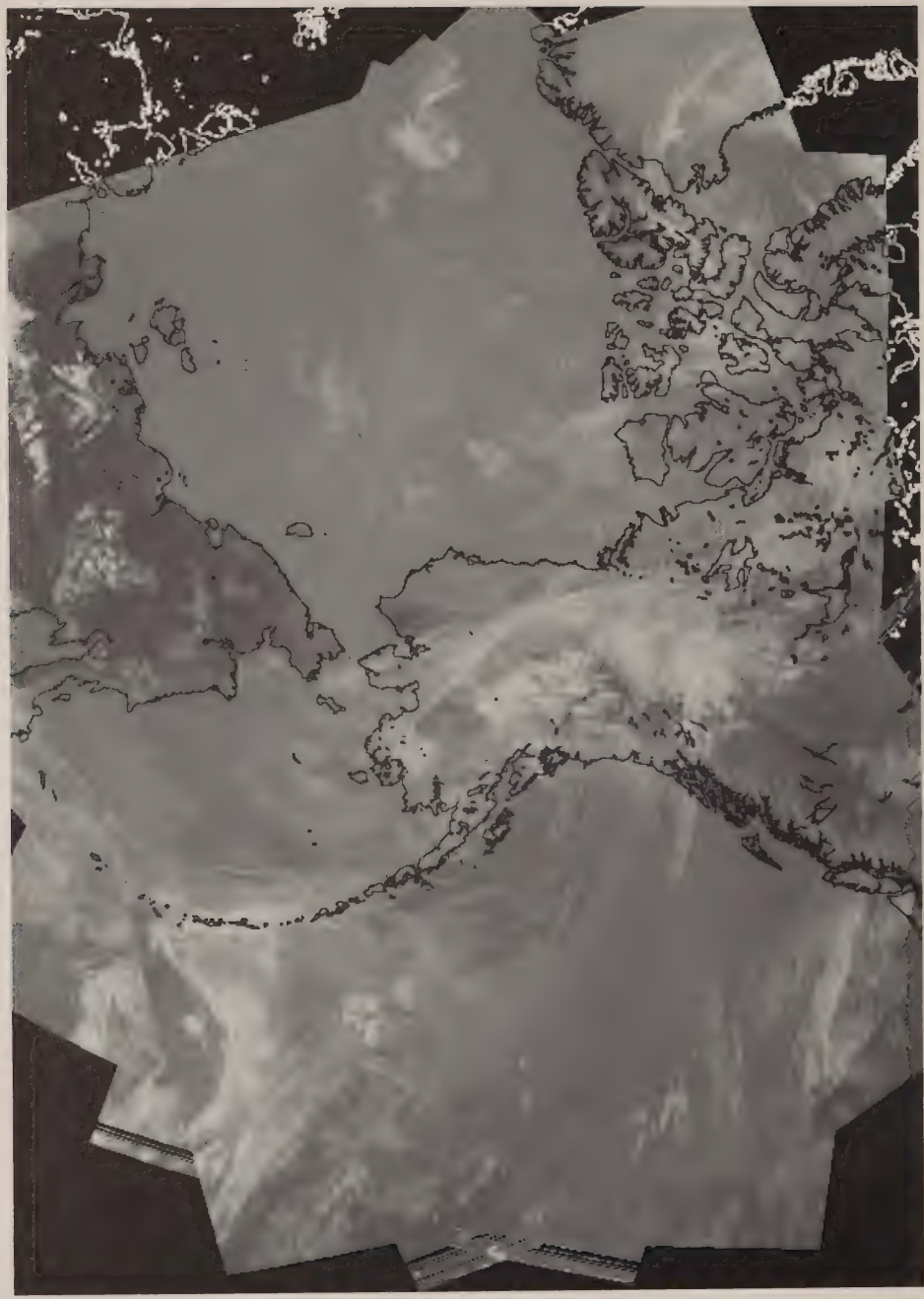
Page 94. Composite images of Arctic regions from NOAA HRPT data, like this one of 24 June 1994, are available on Internet from the University of Alaska, Fairbanks.

LATE NEWS

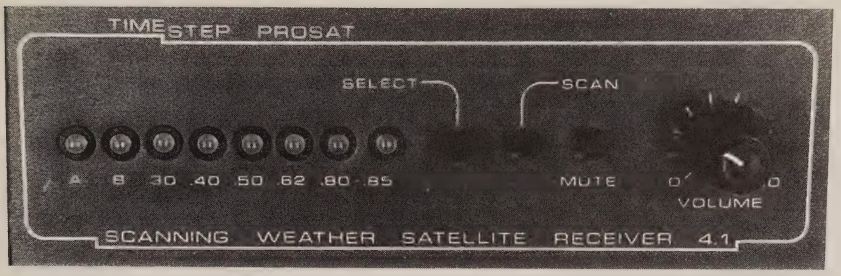
NOAA 10 to be switched off and put in standby mode on 15 November.

RIG AGM 1995 Arrangements are in hand for a special one day RIG convention in Guildford on 29 April 1995. The programme will include the formal AGM, lectures, exhibits and demonstrations on the subject of remote imaging. Full details will appear in the next journal.





RIG-TIMESTEP PROscan POLAR RECEIVER



A professionally made scanning receiver covering all NOAA and Soviet Polar Orbiting Satellites. The frequency can be readily seen via an LED on the front panel and unwanted channels can be locked out. It is designed with a lot of internal filtering, making it ideal for locations that suffer from Pager problems. It is resistant to pager interference at 1 to 2 miles (where the field strength is at maximum), and also carries an unconditional money back guarantee. *See RIG32 page 88 for further details.*

For the latest prices of the above equipment see Rig Shop Corner

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A quarterly publication for hardware, software and applications of WEFAX, APT, VAS, HRPT and GOESTAP.

WeatherSat Ink

The Environmental Satellite Applications Journal

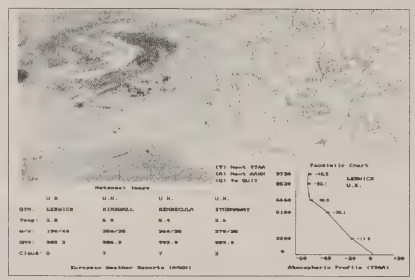
4821 Jessie Drive, Apex, NC 27502, USA

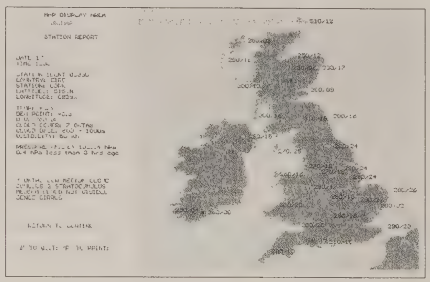
$15 US per year $20 all others, US funds

MasterCard / Visa OK with $1 surcharge

PC - WEATHERSPOT

GRAPHICS DISPLAY OF DECODED RADIO MET DATA WITH DISPLAY OF FAX CHARTS AND SATELLITE IMAGES





METAXX: Decodes the AAXX Land stations, displays temperature, pressure, wind velocity or cloud cover to one of the country maps for Europe or North America. Displays station decoded data to a table on the same screen. Contains a Meteosat Image of Europe for overlays of reports from N. Africa to the Arctic Circle.

AXGRAPH Plots line graphs of the data decoded by the METAXX module.

TTAA: Decodes the radiosonde reports in tabular form which can be printed or displayed with TTDISP module.

TTDISP: Displays the TTAA data as a graph to above the tropopause, indicates atmospheric stability at each level.

SFLOC: Decodes and displays to a European map the intensity and position of lightning striles with a table of the strike latitude and longitude with the number of strikes per ten minute period.

CLIMATE: Decodes the monthly climatic reports and line graphs all the information, i.e Total rain, number of hours sun.

AC3D: Decodes the Airep reports and displays on a rhombus shaped map a pseudo 3D image of trans-Atlantic traffic with temperature, wind velocity and call sign. Concorde identified in white.

BOUY: Plots the positions of drifting bouys on a North Atlantic chart, with maths processing to determine the drift distance and speed. Historic file enables constant tracking of the bouys showing Ocean currents and sea surface temperatures over days weeks or months.

FILTERS: Filter modules are available to clean up the rubbish in radio collected RTTY metcode reports.

WORKSTATION

A special module to display on a single screen the range of data decoded and displayed with the above and to incorporate users own images. A knowedge of image manipulation is required, i.e. clipping, re-scaling, etcThis module requires SVGA 800 by 600 256 colour display with a VESA driver. Tested on Trident, Oak, Orchid cards.

WINDOW 1: Satellite images Meteosat, NOAA, Landsat etc.

WINDOW 2: Facsimile charts taken either by radio from Bracknel & Offenbach or by telephone from METFAX.
A second satellite image.
Electrical storm map for Europe with lightning strike overlay.
User data, i.e. pollution reports and a map of UK.

WINDOW 3: Sideways scrolling data of land station reports, decoded by the METAXX module.

WINDOW4: Radios sonde graphs decode by the TTAA module.

REQUIREMENTS

MINIMUM 286 PC with VGA colour monitor, SVGA monitor with VESA if Workstation is to be used, some 286's are a little slow but usable. A hard drive with at least 10Mb spare space on the C: drive. A 1.44 Mb 3.5 inch floppy drive. Short wave ssb radio, RTTY demodulator and baudot program. (Demod & software available if required £30.00)

North East Satellite Systems, Cropton, Pickering, North Yorkshire. Tel 0751 417598.

Price £91.65 including VAT post & package. Barclaycard accepted.

APT / WEFAX Imaging Systems

JVFAX Interface For those hundreds of you out there who have sampled the excellent JVFAX 6.0 software from Eberhard Beckashof, we offer this superb interface to do it justice. Full data sheet is available from us for the asking, but basically it supports APT/WEFAX and FAX modes, (SSTV is hardware implemented, and it is expected that a resident software upgrade will be available by the time of this advert's appearance). The compact module features a dual microprocessor design, with separate inputs and individually optimized filter sections.

£78 + £2.50 p&p

Latest version of JVFAX Software **£2.50**
JVF1 power supply unit **£6.95**
Serial cables (specify 9-way or 25-way) **£5.00**
Proscan receiver APT cable **£4.00**

Amigasat 3.1 The Amigasat package, like the Amiga, continues to go from strength to strength, with this new version fully supporting Commodore's 256 colour AGA graphics. Remember, if you've got an earlier version you can always upgrade to the latest for a modest sum. Amigasat remains the only package to *reliably* decode the digital headers from Meteosat for truly automatic reception. For a more comprehensive description of version 3.1 see our ad. on p74 of RIG36. **£139.95 + £4 p&p**

MSC30 Downconverter Our policy of continuous development ensures that the MSC30 Downconverter remains the finest you can own: Features include very low noise figure, high gain, buffered output for driving long cables, and good temperature stability. In addition, the MSC30 can be powered either by conventional 3-wire system or via the coax feed. High quality N-type input, BNC output, and housed in an IP65 sealed diecast enclosure. Comes complete with N-type/N-type cable, connectors etc. **£170 + £4 p&p**

MSD30 Dish A 95cm prime focus dish, of spun aluminium. Complete with MSF30 feed & heavy-duty ground stand. Gain - 22dB **£149.50 + £18 carr. & ins.**

MSF30 Feed Our popular 1.7GHz dipole feed for Meteosat, GOES, and GMS **£44 + £3 p&p**

MSQ20 Quadrafilar VHF Antenna. Very compact - ideal for boats and sensitive sites **£48 + £5 p&p**
with integral preamp **£64 + £5 p&p**

MSA20 Turnstile VHF Antenna. Comes with 20m cable and BNC terminated **£36.50 + £5 p&p**

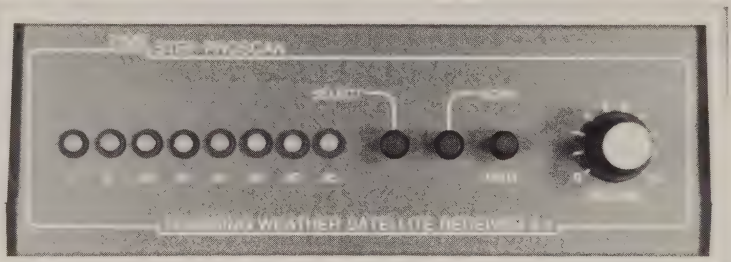
MSL30 1.7GHz LNA Professional-quality low noise amplifier using HEMT GaAsFET first stage, and housed in sealed diecast housing. Has N-type input and output connectors, and power is provided via the output feed.
N_f = 0.7dB, A_v = 28dB min. (other gains to order) **£134 + £4 p&p**

MSK30 137MHz Preamp A new design, offering low noise and wide dynamic range. The gain can be set by adjusting the supply voltage via the feed cable from 4v - 12v, to give A_v = 5dB - 22dB. Nf = 1dB **£18 + £2 p&p**

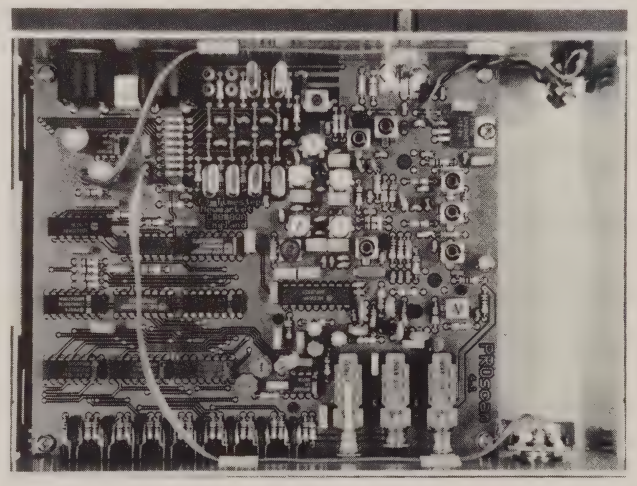
Ordering Information
U.K. and E.U. customers add 17.5% VAT to above prices.
Overseas customers will be charged carriage at cost.
Payment may be made by cheque, postal order, or Visa, Access, and Mastercharge Cards.

The Acorns, Wyck Lane, East Worldham, Alton, Hants GU34 3AW, U.K. Tel / Fax 0420 82752

Timestep Offer to RIG Members
PROscan Polar Receiver



What do you want from a Scanning Weather Satellite Receiver ? a) Intelligent squelch that only responds to weather satellites and is quiet when no satellite is present b) To be able to read the frequency directly from the front panel when it stops on a satellite c) To be able to "lock out" unwanted satellites d) Resistant to pager interference up to the pager transmitter itself (where of course the field strength is low e) Resistant to pager interference at 1 to 2 miles where the field strength is at a maximum f) An unconditional 12 month money back guarantee g) Full technical support directly from Timestep **and** h) the ability to control the receiver frequency from the computer so that you are sure that **all** passes can be received in your absence.



The PROscan receiver uses a lot of filtering, 3 coils in the pre-amp (optional), 4 coils in the RF amp (total 7 coils at RF), 3 coils in the oscillator, 1 matching coil at first IF, 5 ceramic filters at first IF, 5 coils at second IF (total 11 IF filters) and a quadrature discriminator for linearity and high ultimate signal to noise. A preamplifier is not required for short cable runs but adds extra selectivity and makes up for feeder loss on longer runs.
PROscan receiver £185.00 VHF Preamp in diecast box £20.00 **Computer controller** £125.00
UK postage £6.00 plus VAT at 17.5%

Timestep PO Box 2001 Newmarket CB8 8XB England
Tel. 0440 820040 Fax. 0440 820281

Timestep Offer to RIG Members

PROsat II Capture Card

PROsat II has become the most widely respected and definitive Weather Satellite Capture program used by RIG members. It will operate in most contemporary PC's (286, 386, 486 etc with SVGA) and uses one internal slot. All software features are selected with user-friendly mouse-operated pull-down menus. False colour can be added to good quality visible light images. Capable of receiving and decoding all known analogue weather satellites, PROsat II sets new standards in Software and Hardware design. Image processing, full colour animation and 3D are just some of the many features currently included. New features are constantly being added. Now technical support is directly from Timestep. Timestep Weather satellite systems are used and recommended by Arthur C. Clarke, author of "2001 : A Space Odyssey" and inventor of the communications satellite.

Other software comes and geos, sometime the flavour of the month, sometimes forgotten.
PROsat II just gets better and better ! When the new Okean 4 was switched on, it came as no surprise that PROsat II users merely clicked on OKEAN and achieved perfect results, first time.

Geostationary Satellites Meteosat, GOES and GMS are all geostationary satellites; they orbit at the same rate as the Earth and hence appear to be fixed in the sky. Images are therefore constantly available. The PROsat II system covers all known analogue geostationary satellites; images of the Earth's surface can be received as often as every 4 minutes. A small dish antenna is required together with some simple reliable hardware.

Polar Orbiting Satellites NOAA, Meteor, Okean and Feng Yun are polar orbiting satellites. They pass near to the poles about every 110 minutes. Each satellite passes over most countries twice a day at a different time each day. Their strength is such that a simple fixed antenna can be used. Direct readout of temperature along with latitude and longitude is an important feature of the software. Now land/sea and political boundaries can be superimposed on to the image and "nudged" if they are not quite perfectly aligned. All of the satellite data is stored; a full view of Infrared and Visible images are shown on the screen during reception.

Animation 100 frame black and white animation is standard. Full screen, full colour animation is an option. Up to 1,000 images can be automatically animated. The colour is realistic and computer processed (D2 section only) and even shows relative temperature by the shades of blue for the sea and green for the land. Clouds show up as white and shades of grey. Reception is completely automatic. Run the software and walk away; every time you pass, the computer will be showing the very latest sequence.

Geostationary Features
Images as often as every 4 minutes
Live display of incoming images in 64 grey scales
Auto schedule to save images
Pan and zoom to greater than pixel level
3D display
Median filter to remove country outlines
False colour with AutoSet
1,000 frame colour animation (option)
Transect between any two points
600 DPI, 300 DPI and dot matrix printing
Windows export
Annotation

Polar Features
Reception of all polar satellites
Live display of incoming image in 64 grey scales
Auto schedule to save images
Saves the complete pass in full resolution
Temperature readout with no calibration
Latitude and Longitude gridding
Country and State outlining
Distance and Bearing between any two points
Your location shown on image
600 DPI, 300 DPI and dot matrix printing
Windows export
Annotation

Track II The tracking program used by most serious satellite watchers. This is not public domain and was written by Peter Arnold our Cambridge Graduate. Up to 6 satellites can be shown on screen all at the same time. Actual locations, their footprints and their rise and fall times are always shown. To our knowledge, no other program provides these features.

Prices PROsat II card and software £99.00 Colour Animate £65.00 Track II £35.00
PROsat/PROscan connecting cable £12.00 All prices plus £6.00 carriage & VAT at 17.5%

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Special Offers to RIG members

** Winter news from Timestep **

NOAA - Okean

PROsat II users will already know that to receive Okean 4 they just click on Okean ! A PROscan receiver computer controller is now available, that allows the PROsat II software to schedule receive times **and** automatically select the correct channel. You can schedule up to 100 different passes with the software that we have been shipping since January 94.

PDUS/HRPT

As Ian Hanson said, "no serious operator is without **both** PDUS **and** HRPT. PDUS to animate and look at the World and HRPT to acquire the highest details". In other words check out carefully the prices, and consider buying one now and the other later, then you won't miss anything ! At our special RIG prices you can afford both now anyway !

Meteosat encryption

If you have the Eumetsat questionnaire, and or if you currently receive Meteosat SDUS or PDUS, or even if you think you might want to receive Meteosat in the next 5 years, write now to Meteosat Encryption Timestep PO Box 2001 Newmarket CB8 8XB. We will provide a £2,000.00 fund to lobby on your behalf. This will not cost you anything, write now, what have you to loose ?

PDUS

Is looking up, the latest news is that a "limited set of data will remain un-encrypted", to celebrate this we have reduced the price of the complete system (only for a while !). Even later news is that encryption could be delayed, possibly indefinitely ! If you look at our price list you will see that we have cut a massive £500.00 off the system, this offer will not last though. Call for a new colour brochure.

HRPT

Is selling really well in the U.S.A. but not here, so to encourage you to use our 10 bit, 5 band, 1.1Km resolution, software, we have reduced the price of the complete system. We have cut a massive £500.00 off the system for a short time only. Call for a new colour brochure.

Computers

We are replacing our demo stock and have 2 units 486 DX 33MHz with the nice 14" Panasonic monitors, 540Mb hard drives and 24 bit video, going really cheap !

P-HEMT Preamps

We have a few used units that have been refurbished and tested at a noise figure of 0.5dB. These are available on a first come, first served basis for just £99.00 each. This would make your PDUS or HRPT station even cheaper !

Image Processing

Multispectral View II including an image of your choice from England or Wales	£140.00
24 bit video card	£ 70.00
Satview CD ROM 350 GIF weather satellite images	£ 15.00
500Mb of Spot from all over the World CD ROM	£ 99.00

Meteosat PDUS

1.6M dish (inc. patio mount and dish feed)	£330.00
Dish feed (included with the dish above)	£ 40.00
P-HEMT Preamplifier	£200.00
20M cable	£ 15.00
Extra 20M cable and line amplifier	£ 50.00
2 channel PDUS receiver	£400.00
PDUS PC/AT card and full software inc **colour animate**	£150.00

NOAA HRPT

90cm dish, dual feed, all metal work and galvanised ground stand	£250.00
90 degree combiner and cables	£100.00
Yaesu R5400 Az-El rotator	£400.00
25M control cables and heavy duty connectors pre-fitted must be ordered at the same time as the Az-El rotator	£100.00
Tracking card and software for automatic operation	£240.00
P-HEMT Preamplifier	£200.00
20M signal cable	£ 15.00
Extra 20M signal cable and line amplifier	£ 50.00
6 channel (5 fitted) HRPT receiver	£400.00
HRPT PC/AT card and full **10 bit** software	£150.00
Dish feed (dual polarity, for your own dish)	£ 55.00

All prices plus VAT at 17.5% and carriage at £6.00 in Britain. Visa and MasterCard credit cards taken on orders over £25.00.

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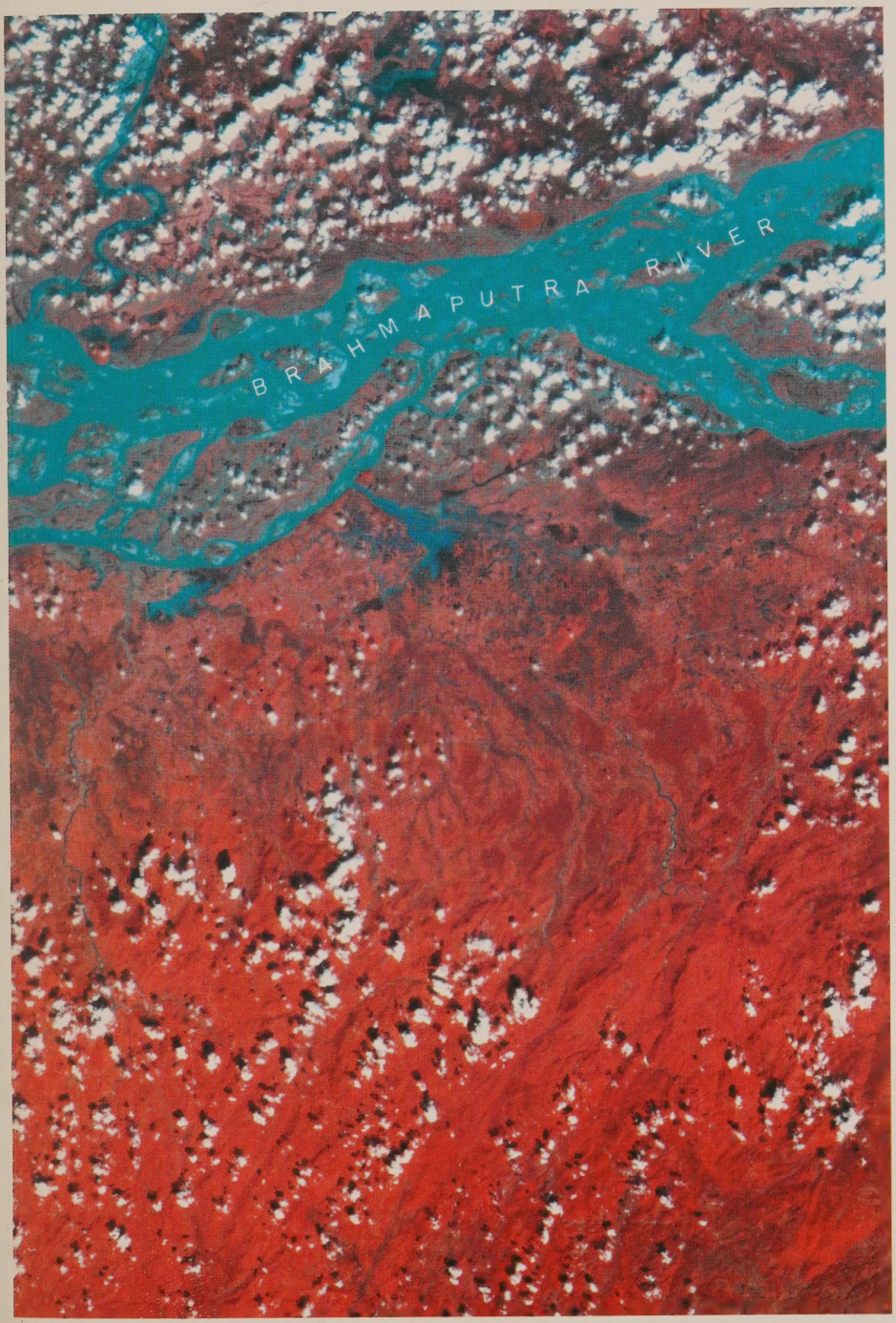
BRAHMAPUTRA RIVER